ANNUAL REPORT FOR FISCAL YEAR 2003/2004

OMAF-FUNDED RESEARCH, EDUCATION AND LABORATORY SERVICES PROGRAMS

Integrated Research, Education and Laboratories Programs
Serving Ontario=s Agriculture and Food Industries

September 30, 2004

105-02270/

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Report compiled by Ken Hough and Office of Research support staff.

EXECUTIVE SUMMARY

Background

This Annual Report is being submitted to the Ontario Ministry of Agriculture and Food (OMAF) in accordance with the terms and commitments under the OMAF / University of Guelph Agreement. This is the second Annual Report under the current 5-year agreement between the University of Guelph (U of G) and OMAF, which was signed March 20, 2002.

The period covered by this Annual Report is the University's fiscal year 2003/2004 (May 1, 2003 though April 30, 2004). The report covers the activities, budgets, expenditures and performance measures for each of the four programs areas encompassed by the Agreement – **Research**, **Diploma Education**, **Veterinary Clinical Education** and **Laboratory Services**.

Summary of Activities and Results

All Performance Measures Agreements (PMAs) of the OMAF/U of G Agreement are reported on in much greater detail later in this report. With few exceptions, the PMAs were unchanged from the previous year. Where changes in PMAs have occurred, these will be noted in the specific sections.

Within the research area, the **Food Research Program** was reviewed by the Agricultural Research Institute of Ontario (ARIO). As well, OMAF, through the Food Processing Research and Services Committee, conducted a strategic review of research priorities for the food sector, which formed the basis for proposals solicited for research for the next four years.

The **Resources Management and Environment (RME) Research Program** had undergone its four-year review in the previous fiscal year. However, at OMAF's request, approximately 40% of Environment Research Program funding had been invested in short-term projects, to accommodate reinvestment in research priorities pertaining to issues arising from the recently established Nutrient Management legislation and regulations. The consultations for identifying these priorities and the processes of soliciting and selecting proposals to address these priorities were completed through the fall and winter of 2003/2004, in preparation for undertaking the research beginning in May 2004.

The renewal of these two programs afforded an opportunity for the University to pilot, with OMAF's and ARIO's endorsement, a significant restructuring in the management and delivery of the research programs. This restructuring focused on three main principles:

- A new focus on value-chains and outcomes-based programs that encourage innovation in meeting the needs and priorities of Ontario as a whole, and the province's agri-food sector in particular.
- A stronger emphasis on building multi-disciplinary teams and engaging researchers from other departments and other institutions to combine their strengths to address the priority/priorities in a more comprehensive and holistic manner and to enhance leverage of U of G/ OMAF Agreement funds.
- A significant increase in the level of operating dollars to be awarded to selected proposals.

Further details on these changes are provided in the Research Program Overview section of this report.

There were 319 active research projects in 2003/2004. Highlights of research accomplishments are provided for each of the research program areas – **Animals** (including Aquaculture, Beef, Dairy, Equine, Pork, Poultry, and Sheep), **Plants** (Field Crops, Horticultural Crops, and Pest Management), **Resources Management and Environment**, **Food**, and **Sustainable Rural Communities**.

Research funding received by the University of Guelph outside of the OMAF Agreement increased substantially to $54.7 million, up 28% from the $42.7 reported for 2002/2003. About $11.5 million of the $12 million increase is attributed to the initiation of the funding for the Advanced Food and Materials Network, the Weather-based Programs for Sugarbeets project at Ridgetown and the Federal Indirect Costs payment.

The numbers of presentations at scientific conferences, articles in the popular press, web-site based presentations, and presentations to industry and stakeholder groups increased substantially in 2003/2004 (see table 1.3.1 for details). Similarly, there was an increase in the number of memberships on provincial, national, or international committees. However, it should be noted that our reporting of these data is becoming more refined each year.

Royalty dollars rebounded to over $415,000 in 2003/2004 up 20% from the previous year levels, but still lagging the royalties generated in 2001/2002. The University's share of total royalties increased to 36.1% in 2003/2004, indicating that an increasing share of non-OMAF money is being utilized in cultivar and technology development.

In the delivery of Diploma Programs, 2003/2004 has been a year of making further adjustments and fine-tuning of programs following the major changes that occurred in the previous fiscal year. Enrolments in Diploma Programs at regional campuses increased in 2003/2004, with enrolment up by 6.1% at Le Collπge d'Alfred, 10.9% at Kemptville and 7% at Ridgetown. The new Turf Management Diploma at Guelph had 31 students enrolled in its first semester in Fall 2003. However, overall Diploma Program enrolment was down by 7.5% when Guelph numbers were included, due to 2003/2004 being the final year for Agriculture and Horticulture Diploma Program offerings at the Guelph campus. Student graduations, employment statistics and attrition data are detailed in the report (Tables 2.3.2 and 2.3.4). The first semester of the new Food, Nutrition and Risk Management Diploma was delivered at Kemptville in 2003/2004. The Environmental Management Diploma Program offered at Ridgetown College beginning in fall 2003 had 33 full-time and three part-time students enrolled for the first year. A new system to secure information on student and employer satisfaction with our Diploma Programs was piloted with the Horticulture Program at Ridgetown. The initial results were positive and the system will be further refined in anticipation of its more widespread use.

Total revenues from Continuing Education (CE) Programs at the regional campuses continue to grow, exceeding $4 million in 2003/2004. This growth is due to a variety of factors including the offering of new programs, expansion of activities in ongoing programs and in this past year, the double cohort. This income is an extremely important component of operating the Diploma Education Programs at the regional campuses, through more efficient use of facilities and staff resources and adding revenues that helps support Diploma Education resources.

The Veterinary Clinical Education Program (VCEP) continued to provide support for the Veterinary Teaching Hospital Clinics, advanced clinical training, an externship and a 1-year post-graduate Veterinary Internship Program. As well, 26 of the 45 students enrolled in the graduate D.V.Sc. Program were supported by the VCEP Program. The Ontario Veterinary Clinic (OVC) has been granted full accreditation by the American Veterinary Medical Association (AVMA) Council on Education for up to seven years.

The Laboratory Services Division (LS) continued to provide high-quality testing and diagnostic services to public and private clients in the agriculture, food and veterinary industries. The Animal Health Laboratory (AHL) performed about 582,000 procedures in support of disease surveillance. The Analytical Laboratory performed 817,000 procedures for plants, soil, water and food. The scope of testing was expanded significantly to meet clients' emerging needs. New methods were developed to detect and confirm chemical contaminants in the food supply and existing methods were expanded. Virology testing was expanded with the addition of 23 new procedures, with an emphasis on rapid diagnostic testing. A screening program for Johne's disease was introduced. Total revenue from outside the agreement increased to over $11 million.

The SPARK (Students Promoting Awareness of Research Knowledge) program was again a prolific source of over 75 articles for a variety of publications, providing profile for U of G research projects in 2003/2004. These articles appeared in a number of media, including a variety of commodity organization publications, agri-food sector print publications, syndicated columns, periodicals, and the University's **Research** magazine. Through the agreement with OMAF's Town & Country Ontario television, the SPARK students contribute InfoBreaks to that program as well.

Management Changes and Acknowledgements

There were several significant changes in the OMAF/ U of G Agreement management team during the course of 2003/2004. **Dr. Dave Hume** completed many years of service with the OMAF / U of G Agreement administration, first as Plant Programs Director, then as Executive Director, and for the past two years as Interim Associate VP (Research) Agri-Food and Partnerships. We wish to extend our recognition and thanks to Dave for his many valued contributions in these roles over the past several years. As of Sept 2003, Dave has returned to his home department, Plant Agriculture, where he is resuming work on his research specialization as well as assuming some new leadership activities in the area of bio-products research.

Dr. Rob McLaughlin assumed the role of Associate VP (Research) Agri-Food and Partnerships in September 2003. Rob is well recognized for his past roles as Vice President, Alumni Affairs and Development, Dean of OAC (2 terms), and previously, as OMAF's Executive Director, Education and Research Division (1985-1990). This wealth of experience and Rob's dedicated commitment to the betterment of Ontario's Agri-Food enterprise will be important contributions to the further enhancement and evolution of the OMAF/U of G Agreement in the coming years.

Ken Hough joined the OMAF/ U of G Agreement administration team in June 2003, initially on secondment from the Ontario Corn Producers' Association (OCPA), and subsequently being hired on as Director, OMAF Agreement. Ken brings a breadth of experience to this position – 14 years with OCPA directing their research and market development activities and environmental programs in collaboration with wide range of research institutions, other farm organizations and agri-food sector stakeholders; several years each with OMAF's Field Crops extension service; the University's Crop Science departmental research programs; managing field research and technical development in agri-business; and first-hand experience in primary agriculture (dairy farming and swine farrow-to-finish nucleus breeding herd).

Rhonda Alger, OMAF Research Programs Administrator left to become the Administrative Assistant in Animal and Poultry Science as of January 1, 2004. Rhonda's very capable and personable service in this capacity since 1994 would have been noted by many faculty and the RPDs, since Rhonda's position was often the 'first line of contact' between project leaders and

the Office of Research on OMAF projects. As of the end of February, the Office of Research welcomed **Sandi Christopher** to fill the Research Programs Administrator position. Sandi returns to the office after having been here on contract as Financial Clerk a few years ago and having served in several other capacities in the interim.

Dr. Roger Hacker finished his term as Research Program Director (RPD) of the Animal Program in January 2004. We wish to recognize Dr. Hacker's devoted and enthusiastic contributions to the program in this role since the inauguration of the Enhanced Partnership between the University and OMAF in 1997. Dr. Hacker has undertaken some much-deserved sabbatical and international travel in 2004, and will be focusing on his research program within the Department of Animal and Poultry Science upon his return.

Rich Moccia has assumed the Animal Program RPD leadership in 2004. Rich is well known for his leadership in the University's Aquaculture Research Program (very active research and teaching programs; establishment of the Alma Aquaculture Research Centre; Species Coordinator for the OMAF / U of G Aquaculture Research Program) and for his previous experience with the private sector in the aquaculture industry. Rich's experience will be invaluable in the coming year's as the Animal Research Program and animal research stations face increasing fiscal and facility challenges.

The University of Guelph expresses its appreciation to OMAF for the support and co-operation in delivering these services to Ontario consumers and agri-food clients.

1. Research Program

1.1 Accomplishments in 2003/2004

Management Accomplishments

- During fiscal 2003/2004, the **Food Research Program** underwent its 4-year review by OMAF and the Agricultural Research Institute of Ontario (ARIO). Performance and accomplishments of the four-year program now completed were presented to ARIO and OMAF in a comprehensive report. As well, the priorities and initiatives for the Food Research Program for the next 4-years were developed, with implementation of new proposed research occurring as of May 1, 2004. A major restructuring of the Food Program was undertaken in this process, which will be discussed more fully below.

- As reported in last year's Annual Report, the **Resources Management and Environment (RME) Research Program** had undergone its four-year review in the previous fiscal year. However, due to the implementation of the Nutrient Management legislation and regulations, a significant portion of the Environment Research Program funding had been invested in short, 1-year term projects, to facilitate reinvestment of these monies in spring 2004 to address sectoral priorities pertaining to nutrient management issues. This allowed the University an opportunity to implement a restructuring of the Environment portion of the RME Program, similar to that undertaken within the Food Research Program.

- The restructuring of these two Research Program areas focused on three primary target outcomes, to improve the overall effectiveness and productivity of the OMAF program, as follows:

    i. Implement larger and broader, integrated research 'programs' involving multi-disciplinary, and inter-institutional teams of researchers to address 'value-chain' outcomes (Food Program) or broad sectoral issues (Environment Program) in a more holistic and inclusive manner than has been attempted in the past with the funding of many individual, narrowly-focused projects. Through this approach, it is expected that Guelph's long-standing strengths in basic agri-food sciences and applied research capacity will be utilized as the foundation for building teams that cover the breadth from primary production through to specific outcomes of benefit to end users of the research (whether these be primary producers, consumers, agri-business, food/industrial product manufacturers, governments, or others).
    ii. Expand opportunities for leverage of the OMAF Research Program funding by facilitating enhanced research partnerships across disciplines, across departments within the University, and between research programs at the university and other research institutions where complementary expertise can be harnessed to optimize the effectiveness of the OMAF Research Program output. In many cases, such collaborations have existed in the past, but the reporting and accountability structure of the OMAF/U of G Research Program precluded effective reporting of these leveraged resources. In addition to improving this reporting functionality, however, the new system is expected to move research collaborations and leverage opportunities to a new plane by encouraging linkages into new areas of research endeavour that complement and build on Guelph's foundational agri-food research strengths.

iii. Pilot a two-phase application/approval process in which researcher teams submit a Letter of Intent (LOI) describing proposed research (Phase 1), with fully detailed research proposals (Phase II) requested from those LOI judged as best able to address the priorities and criteria of the research programs. The rigourous two-stage selection process ensures the research approved for OMAF program funding targets program priorities and sectoral needs, demonstrates partnership support, meets high science standards (assessed through external science review of proposals), has a sound research team management structure, and is cost-effective with a high probability of success. This process is intended to facilitate the building and management of the broader, integrated research teams and the leverage opportunities noted above while, at the same time, improving the researcher's return on time and effort invested in soliciting funding.

A key driver underpinning this restructuring was the commitment by the President of the U of G to 'convert' a million dollars of faculty and infrastructure support from the OMAF Agreement to other sources within the University budget, thereby allowing this million of OMAF funding to be invested in research program operating cash awards within the Food and Environment Research Program areas.

Experience gained through the implementation of this pilot with the Food and Environment Programs is expected to be invaluable as we anticipate moving forward with similar change to the rest of the research program areas in future years.

- Following the strategic analysis and planning exercise undertaken in 2002/2003 that resulted in major changes in the overall program to meet inflationary pressures in the budget, some transitional issues persisted into 2003/2004. For example, despite an agreed on 'Exit Plan' to reduce the infrastructure costs borne by OMAF (above and beyond the $50.5 million contract) pertaining to underutilized research facilities, nevertheless, ongoing requests have been forthcoming from researchers seeking use of vacated or mothballed, but structurally sound facilities. OMAF's consideration and approval of the majority of these requests, despite the added pressure to the Ministry's budget, has been very much appreciated. The exploration of alternative facility management options undertaken by the Ministry in recent months is also much appreciated.

Highlights of Research Accomplishments

Several highlights of the past year's research are listed below under each of the research program areas.

One overall highlight related to the U of G research program merits note here. In a report, entitled "***Canada's University Innovation Leaders***" prepared by Research Infosource Inc. (an Impact Group Company), the University of Guelph was cited as one of only 14 Canadian universities that attracted $100 million or more of research funding in fiscal 2002. The report stated "Apart from the University of Guelph, all the club members have medical schools and affiliated teaching hospitals, whose success in attracting research dollars boosts their university's results."

Animal Research Program

Aquaculture Sub-program:

- Initiated ground-breaking research in the study of fish welfare. This work combined physiological, behavioural and remote telemetry technologies to enhance our understanding of fish welfare and improve wellbeing of captive fish populations.

- Development of improved monitoring protocols to help predict, pre-empt and mitigate eutrophication.

- Established an integrated program of research aimed at reducing the environmental impacts of nutrient waste from cage-aquaculture farms. This included improving feed formulations that enhance digestibility, reduce nutrient outputs, and lower biological impacts on the environment.

- Impacts in the Great Lakes.

- Improved wastewater treatment technologies though engineering research.

- Improved modeling of nutrient energetics in fish.

- Developed genetic marker technologies for trout to permit efficient genetic selection for growth and reproductive performance.

- Added state-of-the-art, warm water recirculation facilities at the Alma Aquaculture Research Station to enhance research delivery. We have also significantly expanded our industrial tech-transfer collaborations at the Alma Aquaculture Research Station.

Beef Sub-program:

- Significant strides were made in the development of edible and intranasal vaccines for administration to cattle.

- Verotoxin producing E. *coli* O157:H7 were found in 52% of 120 beef cow-calf operations sampled in Ontario, demonstrating the importance of developing effective treatments to reduce this pathogen on-farm and minimize the risk of infection in humans.

- Infrared measures of heat loss may be useful in predicting feed conversion ratios as heat production is negatively related to efficiency.

- Probiotic screening studies have demonstrated the importance of comprehensive evaluation of organisms to be used for disease prevention, as results depended on the individual bacterial isolate evaluated. For example, some lactic acid bacteria isolates were found to stimulate the growth of E. *coli*, whereas other isolates hindered E. *coli* growth.

- Heritability estimates for quality measurements related to beef tenderness and flavor in Ontario cattle were found to be sufficiently high to facilitate future improvement through selection.

Dairy Sub-program:

- **Periparturient Immune Function Research:** Understanding the biological and genetic relationships within the immune system of periparturient dairy cows will facilitate identification of individuals with superior immune response (IR) and enhanced disease resistance. To this end, an index system has been developed that identifies, and ranks, cattle with superior inherent IR, particularly during the peripartum period when disease incidence is high and IR is impaired. Given this ability to classify animals based on their IR, it is now feasible to determine which genes dictate high or low immune responders in terms of unique gene expression and quantity of message produced. A bovine microarray system containing ~200 immune and hormone-related genes has been constructed. This array is currently being used to uncover genes associated with resistance to complex infectious diseases, such as mastitis. Knowledge of genes and proteins that influence disease outcomes should provide further means to improve animal health and food safety.

- **Energy Balance Research:** There is mounting evidence that negative energy balance in the prepartum and periparturient period of dairy cattle can have profound consequences on metabolic disease incidence, reproductive performance and production. Recent studies have characterized the impact of elevated levels of non-esterified fatty acid (NEFA) concentration in blood on increased rates of Ketosis and displaced abomasum after calving. Furthermore, subclinical Ketosis immediately after calving has been associated with significantly impaired reproductive performance later in lactation. These studies indicate an important need to develop strategies to identify individual cows and entire herds that have an increased risk of negative energy balance around calving. To this end, a new on-site test for NEFA levels has been evaluated and implemented to enhance the ability to monitor energy balance. Studies are currently focused on strategies to reverse the impact of negative energy balance once it has been detected.

- **Johne's Disease Research Program:** University of Guelph dairy researchers have found that Johne's disease (paratuberculosis) is more prevalent in Ontario dairy herds than originally estimated. A recent study suggests that more than 20% of dairy herds have cows infected with this disease. Further work is being done to better elucidate control points to help producers manage Johne's disease.

Equine Sub-program:

- Development of a vaccine toward Rhodococcus equi, a bacteria causing severe and extensive lung abscesses in foal has been the task of a team of researchers at the U of G for the last 20 years. In this last year, the team reached a break through where an experimental vaccine showed significant evidence of protective immunity in foal exposed to this bacteria.

- Methicillin-resistant Staphylococcus aureus (MRSA) is a very important nosocomial pathogen in humans, particularly in hospitals, and has recently emerged as an important pathogen in people in the general population. This study isolated one specific clone of MRSA from 4.6% of horses studied in Ontario and New York, and from 13% of people. This is a concern because the isolates obtained from people were identical to horse isolates and normally uncommonly found in people. This supports the hypothesis that MRSA is readily transmitted between horses and people, and that MRSA may be establishing itself as an endemic pathogen in horses. Ongoing studies are aimed at further identifying the role of MRSA in equine disease and means of treatment and prevention of MRSA infection in horses and reducing transmission to humans.

- Probiotics are widely available for use in horses; however no commercial probiotics have been shown to be either effective or safe. Because probiotics are considered supplements, not drugs, there is no regulation and requirement for efficacy and safety testing. This study evaluated an equine-origin Lactobacillus organism that was previously shown to have a number of potentially beneficial in vitro properties. However, in a blinded, placebo controlled, randomized study, this probiotic did not prevent neonatal foal diarrhea. In fact, probiotic treated foals were more likely to develop diarrhea and other signs of illness. This study indicates that proper efficacy and safety testing must be performed on probiotic products that are to be administered to horses. Lack of such testing may result in use of ineffective products and potentially induction of disease.

- A trial fibrillation is a sporadic but serious equine health problem - affected horses represent a complete loss as athletes unless treated. Conventional drug therapy involves taking horses that are otherwise clinically normal and converting them into intensive care cases for the duration of treatment. With Transvenous Electrical Cardioversion, catheters are fed through one jugular vein into the heart and electrical cardioversion with a conventional defibrillator applied. The success with this procedure is higher than that for quinidine (common used drug), the technique is safer, and has proven effective in horses. Horses can return to work as soon as 48 hours after treatment with a lesser or similar cost to that for traditional therapies.

- A study was designed to investigate a) the prevalence of the ergopeptine (a mould) in Ontario hay and straw and b) the association between the toxic mould concentrations and potential effect on the reproductive tract. It was found that the Ontario mixed hays analyzed had a very low concentration of ergot alkaloids. The observed concentrations are typical of what we have seen in non-fescue hays in Ontario and are very low in comparison to the ergovaline levels reported as causing problems in fescue hays from parts of the United States. The ergopeptine concentrations present in these Ontario hays did not have a measurable effect on prepartum mares.

- These studies aim to characterize factors limiting the rate of post exercise muscle glycogen re-synthesis and develop nutritional strategies that enhance glycogen replenishment. Key findings to date are that:
  1) the delivery of glucose from the gastrointestinal tract is one factor that limits the availability of glucose for storage in equine skeletal muscle, and
  2) Unlike other species, including humans, glycogen-depleting exercise in horses does not result in post exercise enhancement in insulin-mediated muscle glucose uptake. These findings suggest that glucose entry into muscle is also limiting for glycogen replenishment in the post exercise state. Ongoing studies are further examining the mechanisms for glucose transport and utilization in equine skeletal muscle, and evaluating the effects of novel post exercise nutritional treatments on muscle glycogen storage.

Pork Sub-program:

- The prevalence of pathogens that represent a risk to human health has been surveyed on Ontario swine farms, while molecular techniques are used to monitor how these pathogens spread within and between pig herds and during processing of pigs in slaughtering facilities. This proactive approach to monitoring for these disease-causing organisms has prepared the industry better for future potential food safety concerns involving pork products.

- Candidate gene markers have been identified that are closely related to pork meat quality and sow reproductive efficiency. This will allow Ontario Pork producers to more effectively select pigs that have enhanced pork meat quality and reproductive traits.

- Housing gestating sows in groups in the new Arkell system does not compromise farrowing performance or affect sow body composition. This Arkell sow housing system represents a cost-effective and practical alternative to confining gestating sows to individual pens.

- A variety of feed additives and animal management strategies are being evaluated to enhance gut health and gut development in newly weaned piglets. This research will lead to the development of pig management strategies that are less reliant on the use of in-feed antibiotics, reduce the risk of developing anti-biotic resistant pathogens and contamination of pork products.

- A new state-of-the art feeding system has been installed at the Arkell swine unit. Liquid feeding of swine is an emerging technology in Ontario that represents a means to reduce the prevalence of *Salmonella spp* in pigs, increase the use of inexpensive liquid co-products from the food and bio-fuel industry, and to reduce the use of antibiotics in pig diets.

Poultry Sub-program:

- Four pure genetic lines of chickens from Dr. Shaver are the most recent addition to the Poultry Research Station, greatly enhancing the research capabilities at the University in helping to study the effect and influence of the genetic background on the immune response to infectious agents, disease pathogenesis, behaviour etc.

- Research lead to the development of lutein-enriched eggs attracting a great deal of interest from industry. The "designer egg" contains 3-6 times the normal level of lutein. Consumption of 1-2 eggs daily will make a meaningful contribution to the daily intake of this nutrient, which is important in prevention of macular degeneration and perhaps even cataracts of the eye.

- Interesting and important discoveries were made from studying infectious agents and their interactions with the chicken hosts:
  - It was discovered that the addition of an immunologically selected immunovariant strain of *Eimeria maxima* (causative agent of coccidiosis) to a live oocyst vaccine increases the effectiveness of the vaccine against immunovariant strains of *E. maxima* that could be present in broiler grow-out houses.
  - It was demonstrated that it is possible to immunize birds orally with live, attenuated strains of the bacterium *Clostridium perfringens* in order to protect broiler chickens against necrotic enteritis.
  - A molecular method, reverse transcription polymerase chain reaction, was modified for fast and timely diagnosis of infectious bronchitis virus infection (IBV) in chickens. Utilizing this method and sentinel birds it was shown that a variety of IBV isolates circulate in Ontario even in vaccinated flocks. That means that during stress, secondary infection etc. the virus, which is otherwise held in check, could cause clinical disease.

Sheep Sub-program:

- In the past year, the Sheep Research Program saw projects from several new researchers that had not previously been involved in the program as well as many returning researchers. Some of the projects which were completed in the last year, had discoveries which have lead to new projects to further progress in this area.

- Progress is being made to develop methods by which spermatogonia and hence genetics, can be transferred between a donor male to another male of the same species. Mouse work yielded technologies and results which are now being examined in sheep. This research will ultimately provide applications to both animals and humans.

- A new diagnostic test for the detection of caseous lymphadenitis, for its accuracy in detecting the disease in goats, appears to be very promising. Researchers are taking it to the next step and evaluating its efficacy in eradication programs in sheep.

- New procedures have been developed for genetically improving maternal traits in sheep. To date, most genetic research has focused on carcass and growth traits. Guelph can be seen as a leader in developing indexes that emphasize and balance maternal traits with growth. This work is continuing by now including traits for out of season fertility - which is very important to the Ontario sheep industry. These new indexes have been incorporated into the OMAF Sheep Flock Improvement Program and are currently being used in both Ontario and Quebec.

- Nutritional models have been developed for energy requirements and utilization for the prolific, heavy milking ewe. New data have been incorporated into the OMAF sheep ration formulation software used to balance sheep rations - and will be incorporated into the new NRC recommendations currently being written. Work is continuing by also examining the requirements and utilization of protein for this same class of animals. These data are applicable both to the prolific meat sheep raising triplets as well as for the dairy ewe.

- The first phase of cloning research has been completed. This work investigated techniques to improve both somatic and embryonic cloning.

- The Sheep Research Program is developing innovative means to attract external research dollars to fund either directly or indirectly - sheep research, through the sale of research sheep for medical research that are low risk for Q Fever. Funds raised by this means are to be returned to the program to augment research facilities and operating dollars. Sheep Program participants continue to seek new and continued partnerships both internationally (e.g. the Mexican government), nationally (with the Canadian Food Inspection Agency on Scrapie research) and provincially (with the Ontario Sheep Marketing Agency). Such measures will aid in ongoing viability of the Sheep Program as the OMAF Programs undergo structural change into more integrated, outcomes-based 'value-chain' or 'sectoral issue' programs. One specific success in this regard is the integration of one current priority in the Sheep Research Program - The Effect of Sheep Grazing on Stream Health - into a project under the Environment pillar "Quantification of the risk of pathogens from agricultural enterprises entering water resources".

Plant Research Program

- The development of an "inducible gene expression system" i.e. the ability to control the expression of genes in plants with chemicals, has a broad range of applications in plants. It may be used to produce any protein, such as natural sweeteners, vaccines, antibodies and industrial enzymes in various parts of the plant. This will facilitate the development of bio-based industries that will provide long term sustainable and environmentally friendly employment opportunities for rural Ontario.

- PHA's (polyhydroxyalkanoates) are fully biodegradable polymers produced by bacterial fermentation of sugars or lipids. They can be synthesized directly in plants using bacterial genes and a variety of metabolic engineering strategies. Current research is increasing our understanding of several metabolic pathways with the objective being to increase the PHA content of plants. This will contribute to a relatively low cost/high volume manufacture of renewable-resource based polymers.

- Several genetic loci, previously unreported, that are associated with individual or total isoflavone content in the soybean genome have been identified. This will facilitate the development of soybean varieties with increased isoflavone content.

- Saturated fats have been reduced to below 4% in University of Guelph soybean breeding lines. This provides a healthier oil for human consumption.

- An antibody against *Salmonella* has been expressed in tobacco and can be used to detect the pathogen. Tobacco is an ideal plant-based bioreactor because it is not part of the food chain, is easily transformed, is a prolific seed producer and has large biomass production.

- Winter Canola hybrids with a 30% yield advantage over previous open-pollinated varieties have been identified and this has resulted in a large increase in Winter Canola acreage in Ontario.

- The winter wheat development program introduced five new wheat varieties, RC Doyle, Sisson, PRO 202 SRW, Tribute and RC Strategy. The data to register Freedom and Whitney was also developed.

- A new "hulless" barley variety has a yield increase of 45% relative to the standard variety as well as significant improvements in disease and lodging resistance, and kernel weight.

- The use of the growth regulator, paclobutrazol (Bonzi-4) to improve the quality of tomato transplants results in a 5-day earlier start to the tomato season without a yield or quality reduction. This will result in the production of an additional 60,000 tonnes of tomatoes with a value of approximately $6 million at the farm gate.

- Two systemic acquired-resistance products, Actigard and Heads-up, provide outstanding bacterial spot disease control for tomatoes when followed with the growth regulator, paclobutrazol (Bonzi-4).

- The development of knowledge-based integrated weed management systems helps Ontario growers comply with environmental Best Management Practices such as the Environmental Farm Plan and ISO 14000. This research also contributes positively to the issues of competitiveness of Ontario producers, food safety and to the environmental impact of crop production practices.

- Molecular diagnostic tests, based on differences in the DNA sequences of ALS-inhibitor (herbicide) resistant and susceptible populations of redroot and green pigweed were found to accurately and rapidly detect resistance. A single molecular assay significantly simplifies the detection of weed resistance and will provide growers with confirmation of resistance within three days of receiving a sample. Work is continuing to assess the robustness of the tests and their transferability to other uses.

- Several microbial agents that are extremely effective against *Pythium* root rot in hydroponically grown peppers, cucumbers and tomatoes have been identified. Studies on the timing and amount of microbial agent innoculum applications will provide a basis for protocols to optimize their effectiveness in hydroponically grown crops.

- Progress on integrating natural-source resistance to root maggot and cabbage seed pod weevil into canola cultivars and some other vegetable crops is being achieved and agronomic improvement of the germplasm is evident. This natural-source resistance can save producers significant input costs and provide an environmentally friendly mechanism of control since chemical methods provide only partial control.

- Research on tillage systems has demonstrated that the properly formed berms using the fall semi-ridge till system consistently dried down more quickly than the no-till system and were often fit for planting at the same time as the moldboard plow system. In Ontario, the improved timeliness for planting that results from this increased rate of dry-down is very important.

- Two new insecticides, Citation and Senator, were registered for use in mushrooms for fly control on the casing and as a spawn treatment, respectively.

- Matador insecticide has been registered for control of soybean aphids. When the insecticide is used at the right time during infestations with economic impact, there is a 10 bushel/ac pay back.

- Matador received registration for the control of Swede Midge on *Brassica* leafy vegetables. This helps growers to more effectively manage this devastating quarantinable pest.

- Effective reduced-risk European Corn Borer control products have been identified for use in sweet corn production, thereby decreasing the non-target impact on pollinators, including honey bees.

- An effective Onion Thrip control strategy has been developed and implemented that reduced the cost of onion production, improved onion quality and reduced environmental impact.

Resources Management and Environment (RM&E) Research Program

- Research on the environmental economics of agriculture has confirmed that:
  - the distance between livestock producers and both environmentally sensitive areas and people is an effective means to reduce conflicts between farmers and the local community,
  - there is a positive relationship between spills from farmers within a region and the number of complaints, suggesting complaints can be used by regulators to indicate problem areas but the 'information signal' will be noisy,
  - increases in the percentage of the regions zoned as agriculture decreases the likelihood of complaints, and
  - a study relating the number of building permits issued to southwestern Ontario livestock farmers over a six year period found that barns were being built largely where the livestock sector is concentrated and not necessarily in municipalities with laxer environmental regulations.

- Environmental policy requiring the need for additional land for a farming operation comes at a small cost to farmers who have relatively ready access to neighbouring land. If this is not the case, then stocking density restrictions are expensive since the producer is either forced to purchase land or reduce production levels. The effect explains the increase in land prices in livestock intensive regions of Ontario

- A computer model has been produced to estimate the price of an agricultural insurance product for situations where weather affects critical timing in the production process. Premiums for a weather insurance product for ice wine were estimated. The differences in micro-climates in the Niagara Peninsula implies differences in premiums across locations and the need for weather stations to be located in sites reflective of the local climatic situation.

- Commercialization of biotechnology through three related projects is being studied. The first study examines the process of transferring biotechnologies developed at the University of Guelph to the private sector, the second is a study of biotechnology IPOs in Canada and the third is an analysis of agricultural biotechnology innovation through a joint project with Statistics Canada.

- Production economics research has investigated the profitability of growing raspberries in greenhouses and tunnels in Ontario. This study found that growing raspberries in protected structures in Ontario is an attractive option.

- Other production economics research has investigated the profitability of controlling dandelions in forages in Ontario. Weed control in forages has often been identified as a leading concern among forage producers, but until recently, few viable options for chemical control have been available. Preliminary results indicate that, under selected conditions, chemical control could be profitable for growers in Ontario.

- Marketing research has investigated the potential use of ultrasound technology for hog carcass grading in Ontario. Although significant improvements have been made in Hog carcass quality in Ontario over the last 35 years, competitive pressure from other supply regions is increasing. The findings of this study indicate that there are potentially significant gains for growers and for packers from the adoption of this technology.

- Three participants in the Program, John FitzGibbon, Michael Goss and Douglas Joy, were appointed by the Minister of the Environment to the Provincial Technical Experts Committee on Source Protection Planning.

- Studies on the fate of microbes that enter a river or stream have shown that bacteria can become quickly adsorbed onto fine clay and silt-sized particles of bed sediment and once adsorbed; these bacteria are less prone to environmental stressors and can persist for much longer periods than do those organisms free in the water. Movement of bacteria from the bed sediments into the water column can be a large source of microbial water contamination during periods of baseflow in a stream. The movement of bacteria from sediment into the stream during storm events depends on the presence of a more mobile group of organisms, with further transport requiring replenishment of that group.

- In a BMP evaluation study assessing the effectiveness of storage tank covers for reducing greenhouse gas (GHG) emissions, gas monitoring equipment was installed on covered and un-covered tanks. Methane concentrations in the outlet of the negative pressure cover were extremely large. Combined with typical flow rates of the ventilation pump, these values

indicate an CH_4 flux of ranging from 10 to 83 ug m^{-2} s^{-1} over the late fall and winter. Fluxes for the uncovered tank were little different ranging from 75 to 116 ug m^{-2} s^{-1} over the same period.

Food Research Program

Research activities within the Food Program cover a wide spectrum from studies of molecular-level interactions that are important to food safety and quality, to the identification and assessment of bioactivity of food constituents; the development of stabilization methods for specific functional components in Ontario-grown agricultural products; and the development of innovative processing and packaging methods to enhance and preserve food quality. Significant research outcomes are highlighted below.

- The accomplishments for the 2000 to 2004 Food Research Program were summarized and reported to Agriculture Research Institute of Ontario (ARIO) in February, 2004. This report is posted on the U of G Office of Research website at www.uoguelph.ca/research/omaf/reports/index.shtml. Food research was conducted mainly at the U of G's Guelph campus. The U of G's Laboratory Services and the Guelph Food Technology Centre provide increasing research services to industry, and food research capacity is being expanded at Kemptville College.

- In 2003/2004, funding for Food Program projects remained essentially at 2002/2003 levels. 18 Food Research Program projects were completed by fiscal year-end and 11 were continued in 2004/2005.

- **Food Quality & Safety**
  - Data collected over the past 4 years on E. *coli* O157H7 in dried fermented sausages were used to develop three **mathematical models describing microbial survival**. The models focused on parameters such as water activity, pH, and drying time and their interactions, which are very important during the fermentation and drying processes. The results demonstrated that modeling could be a very useful tool in assessing manufacturing procedures.

  - Research using luminescent phage assays and low-level light imaging systems demonstrated for the first time that it was possible to detect bacteria directly in a variety of foods including milk, meat and eggs by combining these techniques. Subsequent work has shown that luminescent bacterial reporters can be used to monitor events directly on foods in real-time.

  - Mathematical models that describe the efficacy of methods for the decontamination of condemned poultry carcasses have been developed and used to make recommendations to the industry and regulatory agencies.

  - Using ATP bioluminescence, methods have been developed for the assessment of microbial load in milk and on meat that can be performed in about 10 minutes. These methods have been used to monitor and validate HACCP management systems in a poultry plant with encouraging results.

  - Novel methods, using **microfiltration,** to extract byproducts of butter manufacture have been developed. Buttermilk contains not only skim milk-derived proteins (mainly whey

proteins and caseins), but also a fraction deriving from the **milk fat globule membrane (MFGM)**. To promote its use in the food and cosmetic industry, an "upscalable" method to produce the fractions has to be developed.

- A process of solvent fractionation of milk fat was developed and novel products were developed using these milk fat fractions as nutraceutical in infant formulas and confections, as well as a non-trans fatty acid containing hard stock for spread manufacture.

- A unique feed supplement was developed to control *Salmonella* colonization in poultry and to ensure safety of shell eggs. Non-immunized egg yolk powder can eliminate *Salmonella* colonization from the gut of chicken and prevent infection by food-borne pathogens. This is patented by University of Guelph and licensed to a Canada-based poultry corporation.

- Validation of HACCP in pork production and processing revealed that the presence of generic *E. coli* populations within pig herds is a poor indicator for tracing sources of virulent pathogens such as *Salmonella*. The prevalence of *Salmonella* in pig herd is estimated to be 10%. However, it was recovered in 10 out of the 11 carcasses sampled.

- **Value-added components in Ontario-grown food products.**
  - Research has supported the concept that the sphingolipids from milk are important **nutritional/nutraceutical ingredients** and also demonstrated that the fatty acids specific to milk sphingomyelin are readily incorporated into the tissue sphingomyelins in humans and monogastric mammals. It has been demonstrated that the fatty acid composition of milk sphingomyelin can be altered by dietary manipulation.

  - Consumer attitudes towards functional foods in Canada were explored within a rigourous study on the implications of functional properties in food for consumer food choices under various scenarios. Results to date are based on a semi-quantitative mode of data collection, which will be validated through further assessment and analysis. This research will elucidate factors that influence the acceptability of functional foods to consumers and is expected to highlight ways in which policymakers and businesses might communicate the benefits of functional foods to promote their adoption.

  - In humans, following the intake of freeze-dried wild blueberry powder, a postprandial (following consumption) increase in serum antioxidant status was observed. 19 of the 25 anthocyanins present in the lowbush blueberries have been successfully isolated in human blood serum post consumption. This is the first study to report on the absorption of glycosylated and acetylated anthocyanins in humans, and the first to display a correlation between absorption and increased antioxidant capacity. Mean increases in serum antioxidant capacity were identified at 1h and 4h post consumption.

  - Unique **phosphopeptides** from egg yolk phosvitin, a major egg yolk component, have been identified, and a simple method for extraction of phosvitin from by-products of egg processing industry was developed. Using human intestinal epithelial cells, it has been shown that phosphopeptides derived from tryptic digestion of phosvitin enhance the intestinal adsorption of calcium by weakly binding a substantial amount of calcium and preventing calcium from being precipitated by certain substances. The peptides have potential significance as nutraceutical peptides for human health to prevent osteoporosis,

a major public health problem today that affects more than 25 million Americans and is increasing dramatically as the elderly population continues to rise.

- The growth inhibitory properties of total flavonoids from red grape wine, and various flavonoid fractions isolated from such wine by hydrophobic interaction chromatography, were evaluated conducted using MCF-7 cells (ER+ breast cancer cell line), MCF 10A (a spontaneously immortalized normal cell line) and normal human mammary epithelial cells. Authentic flavonoids such as quercetin, naringenin and catechin inhibited the growth of normal cells than that of the MCF-7 cells. Similar effects were obtained when the cells were treated with total wine flavonoids.

- **Innovative technologies to manufacture traditional and new food products.**
  - Low dosage fumigation with thymol and acetic acid vapours can reduce **postharvest brown** rot on apricots and plums. Ontario's tender fruit industry now has an alternative way of controlling rot during storage without the use of synthetic fungicides.

  - **Lycopene** distribution and tomato microstructure were determined on five tomato varieties. It was found that the skin contained 3.5 to 4 fold higher levels of lycopene than other sections of the fruit. This value-added product can be used as a pharmaceutical or as a food additive depending on the level of purification. Enzymatic pretreatment using cellulase, hemicellulase, and pectinase improved lycopene extraction from tomato skin. A combination of mechanical and enzymatic pretreatment produced a lycopene-rich product with levels of 4%.

  - Modeling of **Lycopene extraction** from tomato using **supercritical CO_2 fluid extraction** was conducted. Several soft computing approaches (feedforward neural networks, RBF neural networks, genetic algorithms) and a conventional approach (Peng-Robinson equation of state) were used in the modeling and analysis. In addition, hybrid soft-computing and conventional models were developed for supercritical fluid extraction. An optimal control strategy in terms of a higher extraction yield rate with a lower operation cost and a safer extraction process was developed.

  - A new technique was developed to investigate the **ozone mass transfer** by using 2-D Laser Particle Dynamics Analyzer (PDA) to simultaneously measure bubble size distribution and mixing intensity. Use of this technique was developed to determine the individual mass transfer parameters including the specific surface area, local mass transfer coefficient and enhancement factor due to the occurrence of chemical reaction.

- A new integrated Food Research Program focusing on value-chain and outcomes-based programs was initiated in 2004. This program emphasizes multidisciplinary projects consisting of University of Guelph faculty in collaboration with researchers from Health Canada, AAFC and other universities and research institutions, both domestic and internationally. Three primary research priority areas were established;
  1) Food Nutrition and Health (nutraceutical and functional foods),
  2) Food Safety, Traceability and Assurance and
  3) Food Quality, including value-added opportunities and waste management.

  From 28 Letters of Intent (LOI) received in December, 2003, 12 were selected for submission of full proposals and ultimately 7 projects, each of 3 to 4 years duration, were approved for implementation in May 2004. Funding from the OMAF / U of G Agreement ranges from $81k to $150k per annum per project, with excellent partnering of research personnel/expertise, both within and external to the U of G, and substantial leverage of the OMAF funding through cash and in-kind support..

- The Advanced Foods and Biomaterials Network, a new Network of Centres of Excellence (NCE) had been established, under the leadership of Dr. Rickey Yada, University of Guelph. This national network, which will significantly enhance and complement Guelph's Food Research Programs, is headquartered at the U of G. and has been awarded $22M over next 4 years to address three strategic research themes:
    1) Structure-Dynamics-Function of Foods and Bio-materials;
    2) Functional Foods and Nutraceuticals; and
    3) Related Genetic, Ethic, Economics, Environment, Law and Society issues.

Sustainable Rural Communities (SRC) Research Program

- In 2003/2004, the Sustainable Rural Communities (SRC) Research Program initiated a new four-year cycle of research at the University of Guelph following the review of the SRC Program by ARIO in 2002/2003.
- All research projects will conclude in March 2005.
- After one year the progress has been exceptional with 13 projects funded and leveraged income from over 50% of the projects. For Example, the Innovative Rural Communities project, co-sponsored with $3,000 from TORC (The Ontario Rural Council) and $10,000 from SRC, has garnered over $200,000 a year in collective funding. One project has received SSHRCC funding and another has more than tripled its operating capital. Half the projects concern agriculture and community research, while the other half relate to rural municipalities and rural development.
- In the first year and a half:
    - 2 masters theses have been completed on SRC topics.
    - 1 doctoral research dissertation has been initiated
    - 1 SRC related research paper has been published
    - 4 of the research projects have multi-stakeholder advisory groups
    - Two 'Highlight' sessions have been held where all the SRC researchers reported on their research progress.
    - 2 researchers created research project websites
- Since the start of the new research cycle in may 2003, the Research Program Director (RPD), has given 1 television and 3 radio interviews, spoken at 5 invited community meetings across Ontario, spoken at 3 organizational AGMs, and sits on two inter-governmental research bodies. All of the above presentations have been focused on either the SRC Research Program or the Innovative Rural Communities research project that is co-directed by the SRC RPD.

Results

- A model for Assessing Impact of Rural Non-farm Development on the Viability of Ontario's Agricultural Industry has been developed and tested.
- Innovation is common throughout rural Ontario and does not necessarily occur in clusters.
- Farmland Trusts have major potential for use in 'Green Belt' areas of Ontario.
- The rural-based auto-parts industry is connected to the Mexican auto-parts manufacturing sector.
- Farmers' markets are a key element in short food chains.

Table 1.1.1: Research Projects Conducted in 2003/2004 and Approved for 2004/2005

	2003/2004		2004/2005		
Programs	**# Projects Active [1]**	**# Projects Completed**	**# Proposals Received**	**# Proposals Approved**	**# Projects Active**
Animals	166	46 completed 3 terminated	68	64	181
Plants	[2]76	11 completed 2 terminated	11	8	71
Resource Management and Environment	[2]38	14 completed [3]13 merged	14 LOIs (Env) + 5 proposals (RM)	6 LOIs + 1 Proposal	18
Food	28	18 completed	28 LOIs	7 LOIs	17
Sustainable Rural Communities	[2]11	5 completed	4	4	10
Total	**[2]319**	**112 total**	**130**	**90**	**297**

[1] 'Active' refers to all projects being funded in the specified year and includes new projects (started in that fiscal year) as well as continuing projects (initiated in previous fiscal years).

[2] Adjustments were made to the 2003/2004 numbers reported in last year's Annual Report.

[3] 13 projects already underway in the RME Program were amalgamated into new projects within the new integrated RM&E Research Program.

1.2 Budget

Budgeted and actual expenditures in the five commodity/discipline research program areas in 2003/2004 is shown in Table 1.2-1, below. All research expenditures, including faculty FTEs and program overhead costs, paid from the OMAF program (OMAF transfer payment & program revenues) are included.

Table 1.2.1: 2003/2004 Research Budget and Actual Expenditures (in thousand's of dollars)

	Alfred		Kemptville		Ridgetown		Lab Services Div.		Guelph		TOTAL		
	Budget	*Actual*	*Budget*	*Actual*	*Budget*	*Actual*	*Budget*	*Actual*	*Budget*	*Actual*	02/03 *Actual*	03/04 *Budget*	03/04 *Actual*
Plants	-	-	506	537[1]	1,208	1,226	-	-	6,468	6,622	9,058	8,182	**8,385**
Animals	-	-	383	382	158	144	-	-	5,258	5,196	5,620	5,799	**5,722**
Food	-	-	42	42	-	-	-	-	1,388	1,320	1,256	1,420	**1,362**
RME [2]	-	-	186	181	396	394	-	-	2,164	2,101	2,434	2,746	**2,676**
SRC [3]	-	-	-	-	23	32	-	-	306	291	287	329	**323**
Research Stations	-	-	977	982	548	480	-	-	6,643	7,874	9,374	8,168	**9,336**
Res. Prg. I & S[4]	110	118	80	79	348	156	-	15	62	52	734	600	**420**
Sub-Total	**110**	**118**	**2,174**	**2,203**	**2,681**	**2,432**	**-**	**15**	**22,289**	**23,456**	**28,763**	**27,254**	**28,224**
Institutional Ovhd [5]	89	127	438	441	339	288	-	-	6,055[6]	6,162	6,836	6,921	**7,018**
Total	**199**	**245**	**2,612**	**2,644**	**3,020**	**2,720**	**-**	**15**	**28,344**	**29,618**	**35,599**	**34,175**	**35,242**

[1] Kemptville's Plant Program costs shown above include the expenses within in the Kemptville "Lab Services costs" category (Table 5.1) which pertain to operation of the SPUD unit at NLARS.
[2] Resources Management and Environment
[3] Sustainable Rural Communities
[4] Research Program Infrastructure and Support
[5] Institutional Overhead/Support & Infrastructure
[6] The budget target for Institutional Overhead/Support & Infrastructure for the end of fiscal 2003/2004 at Guelph excludes $2.25 million accumulated transition costs but includes a proportion of $6.6 million service costs and other institutional support and infrastructure.

1.3 Research Performance Measures

Table 1.3.1: This Table lists the Performance Measures in the order shown in the Agreement and the results. The general areas addressed and the specific outcomes expected are described in the 'Objective' and 'Measure/Activity' columns (slightly abbreviated versions on the full wording in the Agreement).

Objective	Measure/Activity	Result
1, A,B,C Priorities	OMAF-identified Research Priorities are met.	Research Program priorities were met. The report on the 4-year (2000-2004) accomplishments in the Food Research Program was presented to OMAF and ARIO in February 2004. New, strategic priorities for the Food and Environment Research Program areas were identified by OMAF, and proposals to address these solicited and approved for implementation in May 2004. An improved mechanism is being developed for identifying if researchers are unable to complete research commitments, and communicating this to Executive Committee.
2, A,B,C Reporting	Delivery on time and within budget A and B. 95% of projects completed on time and within budget. C. Meet 90% of milestones for projects in progress.	A and B. A total of 95 Final Reports for projects were submitted, of which 87% were on time. (Staff turnovers were a contributing factor to this lower performance. As well, other measures are being put in place to minimize such shortfall in future years.) Arrangements have been made to bring all completed projects to a zero overspent balance (by transferring expenses to related trust fund research revenues) C. 90% of milestones for projects still in progress were met. Several researchers commented that they established the milestones in their research proposal but some of the milestones were not met because the researchers received less funding than they had applied for. Other contributing factors included inability to attract the desired caliber of graduate students, and/or early stages of the research results being unanticipated and therefore later stages needing to be significantly changed.
3 Animal Care Standards	Meet or exceed Animals for Research Act and Canadian Council on Animal Care Standards	Demolition and rebuilding of Beef Research Barn # 1 at the Elora Research Station was undertaken in 2003/2004, with completion expected in fall 2004. Cattle were housed at the Arkell Research Station over the winter of 2003/2004. The prevalence of health concerns and animal care deficiencies continues to increase at the Elora Dairy Research Centre. Applications seeking funding to replace the outdated EDRC with a modern, multi-functional research facility have been submitted, but funding has not yet been successfully acquired. Continued efforts to secure funding will be pursued by the University in conjunction with the Ministry. Short-term ameliorative measures to address the most serious care issues at EDRC are being explored.

Objective	Measure/Activity	Result
4, A,B,C Funding from non-OMAF Sources	A. Annually increase funding from non-OMAF sources for research related to the OMAF Agreement.	Total Non-OMAF Funding for Research ($million) / Portion of Non-OMAF Funding for Research Related to Agreement 2003/2004: 86.0 — 54.7 2002/2003: 69.5 — 42.7 2001/2002: 69.2 — 38.5 2000/2001: 61.5 — 35.3 1999/2000: 52.0 — 36.8 1998/1999: 38.0 — 23.8 Details of funding are found at www.uoguelph/research/summaries. Non-OMAF funding for research jumped by 28.1%. About $11.5 million of this increase (and the increase in non-OMAF funding related to the Agreement) is related to the initiation of the funding for the Advanced Food and Materials Network, the Weather-based Programs for Sugarbeets project at Ridgetown and the Federal Indirect Costs payment.
	B. Annually increase research funding from business and industry sources.	B: Business and industry support dropped slightly (2.0%) from the level of the past couple of years. The market pressures faced by several commodities and the end of the Canada-Ontario R&D Program could be contributing factors.
	C. Report non-OMAF funding for infrastructure	2003/2004 $16.1 (million) 2002/2003: 16.4 2001/2002: 16.4 2000/2001: 15.4 1999/2000: 12.2 1998/1999: 12.0 C: Awards were received in 2003/2004 for over $30.5 million in non-OMAF funding for research infrastructure related to the OMAF Research Program objectives. A number of these funding awards were combined CFI (Canadian Foundation for Innovation), OIT (Ontario Innovation Trust) awards and matching contributions. Two major awards were received through Round 4 of the Institutional Innovation Program.
5 Intellectual Properties	Annually increase the number of licenses, patents and royalties.	In 2003/2004, there were 25 germplasm disclosures (new cultivars, hybrids or non-seed propogules) comprised of 17 barley, 1 oat, 3 wheat and 4 soybean cultivars. In 2002/2003 there were 145 germplasm disclosures (14 canola, 38 soybean, 11 cherry, 43 plum, 39 maize). As of year-end 2003/2004, there were 44 OMAF-Program related patents held by the University, of which two were issued in 2003/2004. Of the 44 OMAF-related patents, a total of 35 have been licenced. In the year ended March 31, 2004, there were 24 new exclusive and 8 new non-exclusive germplasm licenses signed. For the same period, there were 6 new non-germplasm licenses (4 exclusive; 2 non-exclusive) and 1 conditional license signed.

Objective	Measure/Activity	Result
6 Royalties	Increased combined seed and technology royalties by an average of 5% per annum over the 5-year term of the Agreement.	Germplasm royalty income rebounded by 20% in 2003/2004 to $415K (net). However, current royalty income is still below the 2001/2002 level. Royalties on horticultural cultivars represented 8.3% of gross royalties and field crops 91.7%. Soybeans made up 57% of the latter, with cereals a distant second at just under 13%. Royalties on non-germplasm technologies in 2003/2004 amounted to almost $95,000 (net) The University's share of the germplasm royalties has increased in each of the past two years, standing at 36.3% in 2003/2004, reflecting a greater proportion of funding for germplasm and technology development coming from non-OMAF sources.
7, A,B Reporting	A. Submit 4-year program reports at appropriate time and submit changes to research programs by Feb. 15 of each year. B. Report to OMAF by Feb 15 on 95% of OMAF projects in their final year. C. Annual summary reports to be submitted to OMAF by Feb. 15 on each project completed or in progress, in a form which can be readily communicated to the public	A. The university presented the proposed changes to the Food and Environment Programs to OMAF and ARIO in fall 2003, and again in Feb. 2004. The 4-year program report for the Food Program was submitted to OMAF and ARIO in Feb 2004. B: The target of reporting to OMAF by Feb. 15 on 95% of the OMAF projects in their final year was not met. By Feb. 15, only 89% of the expected final reports were in. Although this year's results are an improvement over the previous year, additional measures will be implemented to meet this target in future. However, consideration should be given to altering this performance measure, since most projects in their final year have an April 30th completion date. Therefore, it is problematic to expect a completed final report for the Feb. 15th deadline. 94% of expected annual reports for projects were received by Feb 15th. C.: All annual and final project reports received in time were submitted to OMAF in time for preparation for the Research Review Committees' meetings, the majority of which occurred between Feb. 12-23. Researchers are asked to provide, in a form free of non-disclosed information, a summary of results and progress against milestones, and in addition in the case of final reports, their conclusions and the significance of the research to the Ontario agri-food sector.
8 Scientific Productivity	Maintain or increase the annual number of: A: Peer-reviewed journal publications (Target: >300) B: Presentations at scientific conferences (Target: >400)	There were 340 peer-reviewed journal publications reported, compared to 350 in the previous year. In addition, there were 78 books or chapters in books published, compared to 52 in 2002/2003. Values reported are for publications dated in the calendar year, so the 2003/2004 report is for publications in 2003. The total number of presentations at scientific conferences reported was 723, compared to 449 in the previous year.

Objective	Measure/Activity	Result
9 Communication of results to stakeholder or industry audience	Maintain 2002/2003 levels for the combined total number of: A. Presentations in the media B. On the internet C. At stakeholder or industry meetings	A: 304 articles in the popular press, compared to 188 a year ago. Many of the popular press articles are now written by SPARK writers after interviewing faculty, so the faculty are not the authors (see Media section). B: There were 64 new presentations on the internet. Almost all the faculty involved in the Agreement have their own web pages. The total is >300. C: There were 413 presentations to stakeholder or industry meetings, tours, etc. Our reporting of these data is becoming more refined on a yearly basis.
10 Expert Contribution	Maintain the number of committee commitments year to year	There were 371 memberships on provincial, national and international committees reported for 2003/2004, compared to 283 reported for the previous year. Our reporting of these data is becoming more refined on a yearly basis.
11 OASIS Database	Complete a thorough review of research database needs	Various options for implementing updates and improvements to the OASIS Research Database were under consideration during the course of 2003/2004. With the implementation of the revised research program structure (larger integrated research teams focusing on outcomes-based value chains, and seeking greater leverage and partnership opportunities), it was deemed best to defer OASIS upgrades until a better understanding of the database needs under the new program could be determined. Resources will be sought to proceed with the upgrades in 2004/2005.
12 Impact	Identify a method of measuring impact and submit to the Executive Committee	This PMA was addressed in year one of the current 5-year agreement, and reported on in the 2002/2003 Annual report. For some examples of research with significant impact, see the section on Highlights of Research Accomplishments in this Annual Report.

2. EDUCATION PROGRAM

2.1 Diploma Education
Guelph Campus, Alfred College, Kemptville College, and Ridgetown College

2.1.1 Introduction

2003/2004 has been a year of completing the roll-out of new diplomas following the major changes that occurred in the previous fiscal year. Some of the key highlights are outlined below, with full details provided in the individual College sections that follow.

Overall student numbers dropped somewhat (7.5%) as expected, with the closure of general diplomas at Guelph.

Enrolments in Diploma Programs at Regional Campuses increased in 2003/2004. Overall enrolment increased by 6.1% at Le Collège d'Alfred, by 10.9% at Kemptville and 7% at Ridgetown.

At Guelph, the Turf Management Diploma had a successful start; with a target of 30 students, there was an enrollment of 31 in fall 2003, and 29 in semester two (Winter 2004). This cohort will enter its second year in Fall 2004. New enrolment for fall 2004 is expected to be in the range of 34 students.

2003/2004 was also the final year for the Agriculture and Horticulture Diploma Programs at Guelph, with students in their second year of the Diploma Programs completing their studies.

Le Collège d'Alfred's collaborative venture with northern Ontario's Collège Boréal in the area of veterinary technology continues to be successful with increasing enrolment. Initially planned for offering every second year, this program is currently offered on a yearly basis to meet increasing demand. This four consecutive semester program, with the third semester (summer) offered in New Liskeard is now accredited by OAVC following an extensive assessment process by the association.

Development of the Environmental Management Diploma at Collège d'Alfred is underway in preparation for this course to be offered in 2005. Alfred's research activities focusing on the Rural Wastewater Centre are an excellent complement to the Environmental Technology Diploma.

An intense effort by Alfred staff culminated with regional input and submission of the final report of the strategic planning process for the college in May 2004. The report, identifying future directions and opportunities for growth gathered input from College staff and students and community representatives. It presented a series of recommendations with the first phase of implementation in 2004/2005. A more complete report will be available in the 2004/2005 annual report.

At Kemptville, the new Food, Nutrition and Risk Management Diploma was delivered for the first time in 2003/2004. Student evaluations show that the program was well received. A significant promotion and recruitment effort has been underway to raise the profile of this Diploma.

The Agriculture Equine Option, the only such program east of Olds College, Alberta, remains a very popular program at Kemptville with enrolment for 2003/2004 surpassing the projected number of 62 students.

In efforts to specialize in the area of dairy production, Kemptville staff; in collaboration with OMAF personnel and producer input, have developed a new course, Large Herd (Dairy) Management. An enlarged dairy advisory group met in April 2004 and determined that the Diploma needed to continue to provide the theoretical/background scientific basis for agricultural practices but that it needed to increase the hands-on practical component as well. Further planning with respect to course needs and facilities requirements are underway.

Efforts to reduce attrition rates are a priority at each of the regional campuses. At Kemptville a Peer Academic Support for Students ("PASS") group has been instituted, wherein Senior students are recruited to act as tutors for both senior and junior students. The program ran for the first time in 03/04 and was much appreciated by the students who took advantage of the program. The program will be expanded in 2004/2005. Also at Kemptville, a New Student Orientation Program was held in July, with over 90 new students and their families participating in the opportunity to come to the College for the day and to stay overnight in residence if they wished.

At Ridgetown, enrolment in the Diploma Programs increased again in 2003/2004, up 7% from 2002/2003 levels and 23% from 2000/2001. This growth is the result of increases primarily in the Agriculture Diploma and the introduction of a new Diploma in Environmental Management, the first new Diploma Program in more than 10 years at Ridgetown, with 33 full-time and three part-time students enrolled for the first year.

In an effort to provide greater focus to each of their programs, produce better-qualified graduates, and facilitate reinvigorated recruitment efforts, Ridgetown is moving toward identifying major activities of study wherein each major, or stream, would have 18 required courses and an accompanying six electives.

The Veterinary Technology Program at Ridgetown is now accredited by the Canadian Veterinary Medical Association (C.V.M.A.), Canadian Council of Animal Care (C.C.A.C.), Ontario Association of Veterinary Technicians (O.A.V.T.) and the facilities are accredited by the College of Veterinarians of Ontario (C.V.O.).

Ridgetown has also piloted a new system of surveys within its Horticulture Program to secure information on student and employer satisfaction. The initial results this year were positive - some very good suggestions were received, but the overwhelming message from graduates was that the content of the program matches their workplace responsibilities/experiences very well. Both students and their employers expressed satisfaction with the level of knowledge and experience that students receive while at Ridgetown. Plans are underway for further refinement and expansion of the surveys (across all regional campuses).

Although not supported financially by the OMAF program funding, Business Development and Training (BDT) Programs form an integral and extremely important complement to the OMAF-supported Diploma Education programs at the regional campuses. The income gained through the BDT programs and the more effective and efficient use of staff and facilities through the combined BDT and Diploma Education offerings are key ingredients in the viability of the regional campus operations, and thus, the BDT Programs are reviewed briefly in this report.

2.1.2 Guelph Campus

The Agriculture and Horticulture Diploma Programs at the Guelph campus have been discontinued. The new Associate Diploma in Turfgrass Management is the only diploma level program remaining at the Guelph campus. Enrolment in 2003/2004 was 31. Of these students, 29 have successfully completed their first year and moved to the second year of the program in Fall, 2004. The second intake of the program has been increased slightly to 36 students. Interest in the program continues to grow as the turfgrass industry and high school guidance counselors become aware of this new program.

The program continues to utilize a combination of University of Guelph faculty and staff as well as turfgrass industry professionals as instructors in the program. The balance of scientific-based knowledge with practical training are appreciated by the students. Program curriculum continues to evolve based on student and instructor feedback.

Students in the program are required to complete a summer work internship for a minimum of 15 weeks. The demand for student interns greatly exceeded the available number of students. Students found placements at a wide variety of locations in Canada and the United States. Reflection on the work term experience is a component of several second year programs.

2.1.3 Alfred College

Enrolment at Le CollПge d'Alfred of full-time diploma students totaled 122. This is an increase of 7 (6.1%) over the previous year. Creative programming, with new specializations in agricultural technology, contributed to identifying new clients and constitutes a potential for future growth. This is the case with our specializations in Organic Agriculture and International Development within the Agriculture Diploma, which are, therefore, both OMAF supported programs.

In interpreting attrition rates (Tables 2.3.3 and 2.3.4), it is important to consider that a loss of only a few students results in a greater impact on attrition rates due to the lower student numbers at Alfred compared to other colleges.

Costs per student at College d'Alfred are higher due to teaching in a minority language situation where critical masses are more difficult to attain (Table 2.3.7). This situation is well documented and well recognized and had led to government programs (federally and provincially) to assist minority language institutions. However; Alfred is not benefiting due to the fact that its base funding comes from a ministry other than MTCU. The second factor that leads to higher per student cost is the fact that 100% of Alfred's costs are included in education (including operational and maintenance costs for which Alfred is required to pay), since no portion of Alfred's cost are attributed to research. Furthermore, in the case of the Food Program, the cost was only distributed on second year students as there was no first year offered. Similarly, low enrolment in the International Development specialization led us to cancel the program this past September, and thus the costs are also distributed only of second year enrolment.

Our collaborative venture with northern Ontario's Collège Boréal in the area of veterinary technology continues to be successful with increasing enrolment. This four consecutive semester program, with the third semester (summer) offered in New Liskeard is now accredited by OAVC following an extensive assessment process by the association. Collège d'Alfred also offers a certificate for veterinary clerks. Initially planned for offering every second year, the vet tech program is currently offered on a yearly basis, to meet increasing demand.

We have also continued to expand the partnership agreement with the Prescott-Russell Adult Education Centre and Le Centre d'apprentissage et de perfectionnement de Prescott (an adult literacy and training centre) for integrated programming. Adults receive training in specific professional areas (food preparation, landscaping, sales, farm worker and administrative procedures), programs that incorporate in the program the full spectrum of individual needs from literacy and numeracy upgrading, to high school credits, to a college level training that gives them ready access to the job market.

In the past year, with those same partners, the College was successful in developing a common promotion campaign for all adult education in Prescott-Russell. The result has been an increase in the number of inquiries and in the enrolment numbers. This joint promotion initiative is now a permanent feature in adult education in our region.

In the Fall of 2003, the College offered for the first time its newest certificate in food processing technology. This 40-week cost-recovery program, developed by Alfred, but offered under a McGill/Guelph partnership, had an initial enrolment of 12 students who completed the program in May 2004. A second offering is scheduled to start in January 2005.

Through a federal contribution of $125,000, the college undertook a national advertising campaign throughout francophone communities across the country. A large portion of the campaign was carried out through television advertising of programs on Radio-Canada. Some print advertising was also carried out in New Brunswick.

International activities continued to play an important role in Alfred's mission. In addition to on-going projects in the Democratic Republic of Congo (2 projects), in Equatorial Guinea, in the Comoros Islands and in Morocco and Tunisia, Alfred participated in missions in Tchad and Sénégal on behalf of the University. Partnerships with institutions in Romania also continued with a number of visitors coming to Canada and with an AUCC funded mission to Romania. One of the objectives was to promote our food processing technology program in that country. We have also prepared a summer program, in Alfred, for Romanian students from Bioterra University. The visit is planned for August 2004.

Research activities at Alfred continue to focus on our Rural Wastewater Centre, with a number of projects under way or under consideration. The presence of this centre is also very instrumental in supporting the development of our environmental technology Diploma, which is intended to be offered in 2005.

A lot of effort by staff at Alfred was spent carrying out a strategic planning process for the college, with a view to identifying future directions and opportunities for growth. The final internal report was presented to the University President, the Dean of OAC and the Director of OMAF's Innovation and Risk Management Branch, in May 2004 and a series of recommendations will go through the first phase of implementation in 2004/2005. A public report will be released in late 2004 and made available in the 2004/2005 annual report.

2.1.4 Kemptville College

Diploma Education Program

Enrolment:

The total enrolment in Diploma Programs at Kemptville College was 138 junior students and 116 seniors; projected numbers for the period were 152 juniors and 117 seniors. The enrolment in the Food, Nutrition and Risk Management and the Horticulture Diploma was below the expected numbers.

The Agriculture Equine Option is a very popular program at Kemptville. It is the only such program east of Olds College, Alberta. The program is in full operation. Students take the core courses of the Agriculture Diploma and then choose electives that are oriented toward the equine industry. The enrolment for 2003/2004 has surpassed the projected number of 62 students. Riding and Coaching Certificates are available to the Diploma students on a cost-recoverable basis. The Certificates are made possible as we run the Equine Management Certificate Program concurrently as a cost-recoverable program.

The University of Guelph has made the decision to have Kemptville College be the centre of animal production diploma education. Since dairy production is one of the largest animal production sectors in the Province, Kemptville has put a push on to specialize in this area. A new course, Large Herd (Dairy) Management, has been developed in cooperation with College and OMAF staff and with much producer input to address the large herd operators' specific needs.

An enlarged dairy advisory group was brought together on April 18, 2004, and was asked to give direction on where the program should go and what resources were needed to succeed. The group determined that the Diploma needed to continue to provide the theoretical/background scientific basis for agricultural practices but that it needed to increase the hands-on practical component as well. It was the opinion of the group that there was a real need for the College to provide short courses to producers that focus on the hands-on skills.

The first semester of the new Food, Nutrition and Risk Management Diploma was delivered in 2003/2004. Student evaluations show that the program was well received. The curriculum for the second semester has been developed and the necessary equipment and course material are being purchased from the funds that have been raised ($100,000) by the College Foundation and the matching grant ($100,000) from the University of Guelph.

A significant promotion and recruitment effort has been underway to raise the profile of this Diploma. The Coordinator of the program, Ms. Elizabeth Forbes, was named the National Food Executive of the Year for 2003/2004 by the Canadian Association of Foodservice Professionals.

Student Attrition:

There are 108 returning senior students. This represents an attrition rate in the first year of 22% (Tables 2.3.3 and 2.3.4). Six students (4.3%) switched from the Agriculture Diploma - Equine Option to the Equine Management Certificate (1 year) program because they found the academic rigour of the Diploma Program too challenging. The streamlining of the program into the Ag Diploma - Equine Option (academic subjects only) and the Certificate (riding only, on a cost

recovery basis) and getting the students to understand the difference in the two programs has greatly reduced the high attrition problem. Four Horticulture students (2.8%) transferred to Algonquin College when they heard that there would be no intake of junior students into the Diploma this fall because they felt there would be fewer elective courses offered. Another four students (2.8%) decided to take a "year off" for personal reasons.

No matter what the reason for students no longer being in the Diploma Program, it is realized that we at the College need to work on improving our retention rate and, to that end; a Peer Academic Support for Students ("PASS") group has been instituted. Senior students have been recruited to act as tutors for both senior and junior students. The program ran for the first time in 2003/2004 and was much appreciated by the students who took advantage of the program. For the coming year, the number of tutors has been increased and the program has been more widely publicised.

Students expressing an interest in the equine area of study have been counselled more intensely to ensure that they select the program that best suits their interest and academic level than in the past. It is hoped this will reduce attrition rates by ensuring that the students who enrol in the Diploma Program will be successful and to minimize the number of students who transfer into the one-year certificate program.

In July 2004, a New Student Orientation Program was held providing new students and their families the opportunity to come to the College for the day and to stay overnight in residence if they wished. The event was well attended (over 90 participants). The parents seemed to really enjoy the experience and many details were explained to them. It is hoped that this type of event will help to minimize the anxiety associated with coming to college.

Business Development Training Group

Activities in Food Services and Nutrition training, Dairy Apprenticeship, and Horticultural Technician Apprenticeship are complementary to the Diploma Programs and directly support the OMAF programs. Skill training in the Oil Burner Technician, Welding, and Diesel Equipment/Farm Machinery areas are skills needed in rural Ontario and are complementary to rural living. Consulting services in the nutrient management and cleaning of milk-handling systems are basic agricultural issues.

The extra students on campus as a result of these programs add to the well-being of campus life, (i.e. living in residence, eating in the cafeteria, etc.) and the extra revenues generated by these programs are essential in the overall financial operation of the campus (i.e. the extra revenues for residence and cafeteria help keep the costs down for the diploma students).

Food and Nutrition

- **Canadian Healthcare Association Distance Learning**

A new partnership with the Canadian Healthcare Association (CHA) was formed in 2003/2004, and the Kemptville College Business Development Centre (BDC) entered into a 1-year renewable contract agreement. BDC was made responsible for the management of the academic content of two of CHA's distant learning programs: their two-year "Food Service and Nutrition Management Certificate," and their one-year "Nutrition and Diet Therapy Refresher Course." Typical enrolment for these programs is 50 in year one of the certificate, 60 in year two, and 15–25 for the refresher course.

- **Health Care Food Service Certificate**

The certification of dietary aids in long-term care facilities is still a priority for the Ministry of Health. Although certification is not yet a mandatory requirement, Ministry of Health compliance officers strongly recommend this particular training. 2003/2004 saw four groups, taking their certification at Long Sault, Kingston, Ottawa, and Kemptville locations, with total intake of 52 students.

- **Dairy Apprenticeship Link Coordinator**

A partnership developed between Ridgetown (Swine), Kemptville (Dairy), the Dairy Farmers of Ontario, and Ontario Pork, recruited a Coordinator responsible for raising program profile and increasing enrollment in each of these programs. This initiative is expected to result in increased student numbers in the Dairy Apprenticeship for the coming year.

- **Horticulture Technician Apprenticeship (New)**

2003-2004 saw the first intake of 16 students into the new "Horticulture Technician Apprenticeship" program. The program was delivered by BDC in collaboration with Diploma Programming, and is a Ministry of Training Colleges and Universities (MTCU) funded program.

- **Skilled Trades**

The growing void in "skilled trades" continues to create unique training opportunities for Kemptville College's Oil & Gas, Technical, and Power and Equipment programs.

The Oil Burner Technician programs will soon be expanding from residential to light commercial and industrial, with the recent development of that program. Gas Technician training was also added to augment the oil programs, effectively increasing the breadth in student offerings to meet the different industry and consumer needs.

Industrial Welding and Diesel Equipment Mechanic apprenticeships and the varied technical short courses and certifications continue to meet the broad scope needs of the agricultural, construction, highway trucking and heavy equipment industries. These programs increase the earning potential and employment opportunities for our students, and ultimately strengthen rural economies.

Consulting Contracts

- **Nutrient Management**

As part of a joint-venture agreement in the area of Nutrient Management, Kemptville and Ridgetown Colleges collaborated in 2003/2004 in the development of a proposal and subsequent project that focused on Nutrient Management training for Agricultural Compliance Officers, for the Ministry of the Environment.
Kemptville and Ridgetown Colleges were awarded a second Ministry of the Environment contract in January 2004, to develop a "Training Program for the Field Application of Nutrients." This project builds upon previous MOE training involvement, and further expands expertise in the area of Nutrient Management.

- **Dairy Farmers of Ontario**

Kemptville College BDC was awarded a "Dairy Farmers of Ontario" (DFO) contract in 2003/2004 to focus on potable water use in cleaning milk-handling systems. The project involved a publication that developed and discussed alternatives for dairy-persons with water not currently meeting Ontario drinking water standards.

2.1.5 Ridgetown College

Diploma Education Programs

Enrolment in the Diploma Programs at Ridgetown College increased again in 2003/2004 up 7% from 2002/2003 levels and 23% from 2000/2001. This growth is the result of increases primarily in the Agriculture Diploma and the introduction of a new Diploma in Environmental Management. Career opportunities are good in all fields with 100% of the 2004 graduates in the Agriculture program, 93% in Horticulture, and 86% in Veterinary Technology employed by graduation.

New Initiatives

1. Diploma in Environmental Management

In September 2003, the College introduced the first new Diploma Program in more than 10 years at Ridgetown in the area of Environmental Management. Initial recruitment efforts were successful with 33 full-time and three part-time students enrolled for the first year with an even split of students in the two streams of the program - Agricultural/Rural and Municipal/Industrial. As our first class returns to campus as Senior students in the fall 2004, they anticipate the diversified career opportunities that industry will provide to them as graduates in May 2005. In the meantime, they are keeping their options open by signing up for extra electives in the second year. Several of the course instructors are veterans of the college system and several were new to the college, including some with considerable experience in environmental issues. The blend seemed to be very good and exposed the students to a wide variety of viewpoints. Since most of the courses and half the instructors were new, we went to extra lengths to get feedback from students as the program unfolded - including class meetings and course reviews. This provided us with positive feedback to build improvements into the program for subsequent years. In addition we are putting together a database of environmental contacts, mainly in southwestern Ontario. This represents potential employers and potential advisory board members. So far, we have produced a program newsletter and sent it to this group to keep them current on developments in the program. The newsletter is also posted on the college web page.

2. Program Streaming

The college is moving toward identifying major activities of study. We are suggesting that each major, or stream, have 18 courses that are required with an accompanying six electives. This will provide greater focus to each of our programs and produce a better-qualified graduate. It will also reinvigorate recruitment efforts in traditional areas.

3. Distance Education

In collaboration with the Office of Open Learning, Ridgetown College is developing three new distance courses for diploma students. They are, Landscape Construction, Landscape Design and Greenhouse Management. This will be our first venture into this new teaching format.

4. Accreditation

In the Veterinary Technology program a number of accreditation visits occurred during the 2002/2003 period, and official notification of successful accreditation was received in 2003. The Veterinary Technology Program is now accredited by the Canadian Veterinary Medical Association (C.V.M.A.), Canadian Council of Animal Care (C.C.A.C.), Ontario Association of Veterinary Technicians (O.A.V.T.) and the facilities are accredited by the College of Veterinarians of Ontario (C.V.O.). Along those same lines, there is much work being done by groups representing the Horticulture industry such as Landscape Ontario and Flowers Canada to establish program standards, certifications, accreditations etc. for all educational institutions across Ontario. Ridgetown is playing an active role in the development of those guidelines

5. New Diploma Programs

The college is investigating the need for a two-year greenhouse management Diploma Program that would focus on vegetable production and, if appropriate, floriculture. Several meetings have been held with individual growers and with TOGA (The Ontario Greenhouse Alliance) and additional efforts will be required to link industry requirements with educational programming.

Student and Employer Satisfaction

We have implemented a new system to secure information on student and employer satisfaction with our Diploma Programs. We are coordinating this through the program coordinators who will contact employers identified by graduates to determine their level of satisfaction. On a pilot basis this was tried in the Horticulture Program. The results as follows were positive - we have received some very good suggestions but the overwhelming message from graduates is that the content of our program matches their workplace responsibilities/experiences very well. Both students and their employers are pleased with the level of knowledge and experience that students receive while at Ridgetown. Program coordinators will continue this effort and include quantitative measures of satisfaction.

Student Attrition

Student attrition at Ridgetown is currently at manageable levels. The peer helper program, now in its 4th year is making a difference in retaining students. In addition, those students having academic difficulty are identified by mid-terms and they receive additional counseling and support through program coordinators.

Business Development and Training Programs

Although BD&T programs are not supported through OMAF funding, nevertheless, these programs are crucial to the delivery of Ridgetown's Diploma Education programs, for example, the unencumbered revenue (roughly $100,000 per year and expected to grow) is used to support OMAF diploma education programs.

In addition, several programs support general OMAF initiatives. For example, partnerships with OMAF extension and industry to conduct the South West Ag Conference in January and Diagnostic Days in July are very successful tech transfer opportunities, and have led directly to the formation of the Farm Smart Conference and Field Days at Guelph/Elora. Further, many of the provincially mandated programs provide direct benefit to OMAF clients – i.e., Ontario Pesticide Education Program, Livestock Medicines Education Program, etc.

Growth in BD&T activities at Ridgetown is coming from new programs (i.e., Landscape Management Certificate, GIS Excellence In Series) and expansion of activities in ongoing programs (OPEP, Conferences, etc.).

The reduction in student days in CE/BD&T (Table 2.4.2) is directly attributable to the reduction in the Livestock Medicines Education Program. In 2002/03, there was a strong indication that this would be mandated by the Government through legislation. Thus many producers choose to take the course assuming it would be legislated anyways. In the following year, it became evident that the Livestock Medicines Act may not be enacted and there was a significant drop-off in participation.

New Initiatives/Opportunities

1. Apprenticeship Training
This year Ridgetown College partnered with Kemptville College, Ontario Pork, Dairy Farmers of Ontario, Ontario Pork Industry Council, MTCU, Farms.com and OAC through a CanAdapt Small Projects Grant to hire a Livestock Apprenticeship Link Co-ordinator. The objective of the project is to increase awareness and registrations in both the swine herdsperson and dairy herdsperson apprenticeship programs.

2. Alumni Development
Recently, the College hired an Alumni Development co-ordinator to lead both alumni communications and special projects as well as develop and co-ordinate alumni fund-raising activities. The College held its first Annual WestAg Summer BBQ in July 2004 and will also host a first Annual OAC/WestAg Golf Tournament in Ridgetown in September 2004.

3. Short Course Training
The ***Excellence-In*** short course series offered new one-day courses in GIS Technology for agribusiness and producers. This new program will be offered again along with additional short courses for agribusiness. Two new correspondence courses were developed and marketed to Veterinary technicians. These two courses offer CEU's approved by the Ontario Association of Veterinary Technicians.

4. Development of Nutrient Management Training Material
Ridgetown College & Kemptville College are currently working with Nutrient Management Branch, OMAF, to develop a course on Applying Nutrients to Land for the Nutrient Management Act and Regulation. This course will constitute one of the core training requirements for several types of farm/nutrient handling operations requiring licences under the NMA to apply prescribed materials to land.

5. MOE Grandparented Operator Exam Preparation Course
Under the provisions of the new *Safe Water Drinking Act,* the Ministry of Environment is offering courses to assist 'grandparented' operators prepare for certification exams for water treatment and distribution. Ridgetown College will be providing the administration for these courses over the next two years.

Updated Programs

1. Certificate Training Programs (full-time)
The one-year Veterinary Medical Office Administration Certificate Program continues to run with an average of 20-30 students per year and operates on a cost-recovery basis. The program utilizes some of the excellent teaching facilities of the Veterinary Technology Diploma Program and where efficient, shares staff teaching expertise.
The Landscape Management Certificate Program, also a one-year program was offered for the second time in January 2004. With steady growth experienced, enrolment is expected to increase to 20-25 students per year. On campus expertise from instructors in the Horticulture Diploma Program is shared with the Certificate Program students as both groups complete some horticulture courses together.

2. Agri-Link/Farm Market News continued to offer farm market information and news services to many Ontario clients.

3. Ontario Pesticide Education Program (OPEP)
The continued support of AGCare, MOE, OMAF, OABA, CropLife, Ridgetown College, and the University of Guelph has enabled OPEP to meet its goals and to deliver effective pesticide safety training and certification for farmers, agricultural assistants and vendors for 16 training seasons. Careful monitoring of the budget and a continuing review of program resources will ensure that pesticide safety education, training and certification continues to benefit Ontario agriculture. OPEP looks forward to a continued working relationship with our partners to address future opportunities and directions for this program.

4. Ontario Pesticide Training and Certification Program
Through a Memorandum of Understanding with MOE, Ridgetown College administers pesticide training & certification for candidates who wish to apply to the Ontario Ministry of the Environment (MOE) to become Licenced Exterminators. The continued threat of West Nile virus has resulted in a large demand for exterminators to control mosquitoes carrying West Nile virus to protect public health. Issues surrounding the environmental impact of pesticides for cosmetic use in landscapes continue to impact the program as well.

5. Ag Business Centre (ABC)
The Ag Business Centre continues to partner with Economic Development Services of Chatham-Kent, and Sarnia Lambton Economic Partnership, as well as provide office space for Kent Federation of Agriculture, and Rondeau Watershed Coalition. In the past year, ABC has hosted public information sessions on *Food Industry Growth Trends* and *Effective Meetings*; provided

administrative and registration support to the annual **South West Ag Conference** and **South Western Ontario Pork Conference** in partnership with OMAF, producers and industry; and co-ordinated two agricultural awareness programs: **Rotary Career Edge**, and **Kent Days.** The ABC also provides French language support services to other programs on campus.

6. Conference & Facility Services
Conference and Facility Services continues to coordinate facility bookings for both internal and external groups at Ridgetown College, utilizing campus facilities when they are not being used to capacity by students. This includes overnight summer conferences, and day meetings and special events throughout the year.

7. Livestock Medicines Education Program
OMAF's Livestock Technology staff continue to work with the industry-led Ontario Livestock Medicines Education Program (LMEP) to try to implement mandatory certification programs for over-the-counter livestock medicines. The province's commodity associations are requesting that their members take the livestock medicines course administered by Ridgetown College as part of overall education on the safe administration of medicines to livestock, poultry and fish. Over the next year, the goal is to have the regulatory framework in place for mandatory certification of producers.

8. IPM Accreditation Program
This voluntary program has been developed by the IPM-PHC Council of Ontario to recognize landscape companies, park systems, and golf courses that demonstrate their knowledge of and commitment to the principles of IPM through a process of certification, audit, and professional development. Ridgetown College has a program administration contract with the IPM-PHC Council. Low participant numbers for this voluntary program continue to be a challenge to program success.

2.2 Diploma Education Budget

Table 2.2.1: Diploma Program Expenditures, 2003/2004 (in thousand's of dollars)

Program	Alfred		Kemptville		Ridgetown		Guelph		Totals	
	02/03 Actual	03/04 Actual	02/03 Actual	03/04 Actual	02/03 Actual	03/04 Actual	02/03 Actual	03/04 Actual	02/03 Actual	**03/04 Actual**
Agriculture	538	645	299	429	590	606	540	400	1,967	**2,080**
Horticulture	190	-	219	170	428	418	505	320	1,342	**908**
Food and Nutrition Management	133	156	236	341	-	-	-	-	369	**497**
Equine	-	-	419	258	-	-	-	-	419	**258**
Vet. Tech.	130	180	-	-	775	798	-	-	905	**978**
Turf Mgmt							-	104	-	**104**
Ent'l Mgmt	-	9	-	-		225			-	**234**
Dipl. Ed. – Academic Support Services	262	307	257	315	283	303	26	54	829	**979**
Sub-total: Dipl. Ed.	**1,253**	**1,297**	**1,430**	**1,513**	**2,076**	**2,350**	**1,071**	**878**	**5,831**	**6,038**
Inst'l I. &.S (Dipl. Ed.)	691	657	227	253	271	273	656	314	1,845	**1,497**
Dipl. Ed. Total	**1,944**	**1,954**	**1,658**	**1,766**	**2,347**	**2,623**	**1,727**	**1,192**	**7,676**	**7,535**

Note: Data presented in this table, for both fiscal years, is based on the new cost allocation methodology, first implemented in 2002/2003. However, the 'old methodology' was used for presentation of all data in the 2002/2003 Annual Report, with the exception of Table 2.3.7 (Cost per Student calculation). Therefore the 2002/2003 data shown here in Table 2.2.1 has been restated to provide comparison to the 03/04 results.

2.3 Diploma Education Program Performance Measures

Objective	Measure/Activity	Result
1, A, B, C Deliver high quality education and training programs that meet the needs of the Ontario agri-food and rural sectors.	A. Deliver programs using the most current knowledge and skills available through effective teaching programs B. Develop MTCU-style program measures and standards. C. Report annually on: - % student satisfaction - satisfaction of employers with graduates hired - percentage of graduates finding full-time employment Maintain enrolments, graduations, employment levels and satisfaction of students and employers. Reduce attrition rates.	A. These objectives were met. B. The Provincial Diploma Committee, which includes representatives from all of the Colleges, has been working on these new measures and standards and is ahead of schedule. Program measures and standards, which describe vocational learning outcomes pertinent to each area of study; have been completed for the Agriculture, Horticulture and Veterinary Technology Diploma Programs. The Standards for the Environmental Management and Turfgrass Diplomas are expected to be completed in 2005 C. A new system to secure information on student and employer satisfaction was piloted with the Horticulture Diploma Program at Ridgetown, with positive results. In addition to providing some very good suggestions for improvements, the predominant feedback from graduates was that "the content of [the Horticulture Diploma] program matches their workplace responsibilities/experiences very well" and that students and their employers are pleased with the level of knowledge and experience that students receive while at Ridgetown. Program coordinators at Ridgetown will continue this effort and include quantitative measures of satisfaction where feasible. It is hoped this type of survey can be implemented across all locations in the future. - Enrolments across the 4 locations offering Diploma Programs were down by 7.6%, due to 2003/2004 being the final year of offering the Agriculture and Horticulture Diplomas at Guelph. However, counting only the Alfred, Kemptville and Ridgetown campuses, enrolments were up by 10.8% from the previous year. Graduations rose by almost 29% in 2003/2004. Employment and satisfaction levels were maintained. Attrition levels were comparable or reduced slightly from 2002/2003 levels.
2 Strategy identifying new and regionally differentiated directions for education and training programs	By April 2003, complete Strategy, for presentation to Executive Committee	Dr. Craig Pearson, Dean of OAC, reported to the Executive Committee on the strategic plan for the Diploma Programs in fiscal 2002/2003, thus this PMA is complete. Efforts are ongoing at the regional campuses to implementing the agreed on new directions and program differentiation to meet regional needs and the core strengths at each campus. A new cost reporting system was implemented for 2002/2003 to better measure the cost of delivering Diploma Programs. A complete audit of all diploma operating costs is planned for 2004/2005.
3 Increase College revenues through partnerships with industry or other educational institutions	Demonstrate positive growth in non-OMAF revenues over the 5-year term of the Agreement. Report annually on % change in non-OMAF funding.	Non-OMAF Revenues related to Diploma Programs and Continuing Education/Business Development & Training programs increased by $160k, to $10.25 million in 2003/2004. This is an increase of 1.6% over 2002/2003.

Objective	Measure/Activity	Result
4 Continuing Education Programs	Expand CE Programs on a cost recovery basis, meeting regional needs. Track and report cost recovery status of CE Programs. Maintain 2001/2002 levels of CE revenues	Revenues for Continuing Education/Business Development & Training programs increased slightly, compared to the previous year, topping $4 million in 2003/2004. In 2001/2002, the reported CE/BDT revenues were $3.27 million. Total net expenditures reported in 2003/2004 were comparable to the 2001/2002 level.
5 A, B Financial Accountability	Report annually on: - Annual average cost per diploma student - Annual cost per student by Diploma Program Maintain or decrease cost per student from 2001/2002 level.	The 'Net Cost per Student' (based on Total Net Expenditures per Student) increased for all Diploma Programs, with the exception of the Horticulture and Vet. Tech. program relative to 2002/2003. See table 2.3.7 for details. With the exception of the Guelph-based Turf Management Diploma Program, higher per student costs were, in a very general sense, indirectly proportional to student enrollment numbers in a program.

Enrolments

Table 2.3.1: Summary of Diploma Program Enrolments (Full-time students)

	Alfred	Kemptville	Ridgetown	Guelph	Total	Change
2003/2004	**128**	**254**	**398**	**203**	**983**	**-7.5%**
2002/2003	115	229	360	359	1,063	3.3%
2001/2002	109	223	341	356	1,029	-2.3%
2000/2001	111	238	323	381	1,053	1.6%
1999/2000	87	251	348	350	1,036	-8.0%
1998/1999	94	293	347	392	1,126	0.2%
1997/1998	112	272	316	424	1,124	1.8%
1996/1997	111	295	297	401	1,104	8.2%

Graduation Statistics

Table 2.3.2: 2002/2003 Graduates

Diploma Program	Alfred		Kemptville		Ridgetown		Guelph		Total	
	02/03	03/04	02/03	03/04	02/03	03/04	02/03	03/04	02/03	03/04
Agric.										
- Graduates	26	23	24	51	73	69	81	128	204	271
- % Employed	100%	100%	95%	95%	97%	100%	97%	N/A		
Horticulture										
- Graduates	3	2	9	12	13	16	42	41	67	71
- % Employed	100%	unknown	88%	90%	91%	93%	96%	N/A		
Food										
- Graduates	1	7	9	14	--	--	--	--	10	21
- % Employed	100%	72%	90%	90%	--	--	--	--		
Equine										
- Graduates	--	--	26	22	--	--	--	--	26	22
- % Employed	--	--	92%	95%	--	--	--	--		
Vet Tech										
- Graduates	0[2]	20	--	--	35	36	--	--	35	56
- % Employed	--	100%	--	--	72%	86%	--	--		
Total										
- Graduates	**30**	**52**	**68**	**99**	**121**	**121**	**123**	**169**	**342**	**441**
- % Employed	**100%**	**96%[1]**	**92%**	**93%**	**89%**	**95%**	**97%**	N/A	**93%**	

[1] Students that have not been able to be reached after 3 tries have not been included in the calculation of % Employed
Similarly; students pursuing further studies have not been included in the calculation of % Employed

[2] No graduates in Vet Tech. at Alfred because there was no 2001 cohort

Note: Fall 2002 was the last enrolment of new students in the Equine Program at Kemptville, and the Agriculture and Horticulture Programs at Guelph

Table 2.3-3: Attrition Rates for 2002 and 2003 Diploma Cohorts (2-year programs)

Table 2.3.3a: 2002 Cohort

	Alfred[2]	Kemptville	Ridgetown	Guelph	Total
# Enrolled in Fall '02	73	142	143	210	568
# Enrolled in Fall '03 [1]	56	116	133	170	475
# Graduated	44	99	121	169	433
Attrition in Year 1	21%	18%	7%	19%	16%
Attrition in Year 2	21%	15%	9%	0.6%	9%
Total Attrition	**37%**	**30%**	**15%**	**20%**	**24%**

[1] Actual enrolments in Fall '03 (Numbers shown in 2002/2003 Annual Report for Fall '03 were pre-registration enrolment data).
[2] Attrition for Year 1 and overall excludes two students that started in Fall '02 and graduated in May '03.

Table 2.3.3b: 2003 Cohort

	Alfred	Kemptville	Ridgetown	Guelph	Total
# Enrolled in Fall 2003	54	138	204	31	427
# Enrolled in Fall 2004[1]	45	110	176	29	360
Attrition Year 1	17%	20%	14%	6.5%	16%

[1] **Figures for Fall 2004 are based on pre-registration numbers,** which may not reflect actual enrolments accurately.

Table 2.3.4: Summary of Attrition Statistics – 2 year Diploma Program

	Alfred	Kemptville	Ridgetown	Guelph	Total
Attrition in Year 1					
2003 cohort	17%	20%	14%	6.5%	16%
2002 cohort	21%	18%	7%	19%	16%
2001 cohort	19%	25%	5%	7%	12%
2000 cohort	17%	24%	13%	2%	12%
1999 cohort	0%	30%	19%	4%	15%
Attrition in Year 2					
2003 cohort	n/a	n/a	n/a	n/a	n/a
2002 cohort	21%	15%	9%	0.6%	9%
2001 cohort	12%	23%	14%	17%	17%
2000 cohort	3%	15%	12%	6%	9%
1999 cohort	22%	24%	15%	16%	18%
Total Attrition					
2003 cohort	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**
2002 cohort	**29%**	**30%**	**15%**	**20%**	**24%**
2001 cohort	**29%**	**42%**	**19%**	**24%**	**27%**
2000 cohort	**20%**	**35%**	**24%**	**8%**	**20%**
1999 cohort	**22%**	**47%**	**31%**	**20%**	**31%**

Table 2.3.5: Attrition Rates for 3-year Vet. Tech. Program at Ridgetown

The summer Vet. Tech. program is a three-year course, so the numbers cannot be included with the two-year program numbers. This table summarizes the enrolments and attrition rates for this program.

Summer Vet Tech Cohorts Summer Vet Tech Cohorts

	Cohort Year				
	1998	**1999**	**2001**	**2002**	**2003**
# Enrolled in Fall 1998	36				
# Enrolled in Fall 1999	25	40			
# Enrolled in Fall 2000[1]	24	34			
# Enrolled in Fall 2001		31	40		
# Enrolled in Fall 2002			30	43[2]	
# Enrolled in Fall 2003[1]			27	35	0[1]
# Enrolled in Fall 2004				35	
Graduated	24	31	27		
Attrition in Year 1	31%	15%	25%	19%	
Attrition in Year 2	4%	9%	10%	0%	
Attrition in Year 3	0%	0%	0%		
Total Attrition	33%	23%	33%		

[1] No intake of Vet. Tech. students in Fall 2000 and 2003 due to space limitations.

[2] This number is adjusted from the 2001/2002 Annual Report to reflect actual enrolment rather than pre-registration numbers.

Table 2.3.7: 2003/2004 Cost per Student by Program (in thousand's of dollars)

	Diploma Program Agri[2]	Env't[3]	Equine	Food	Hort	Turf[2]	Vet Tech	Int'l Dev[4]	Total
Summary									
Number of Students September 2003	525.75	36	26	54	128	31	187	10.25	**998**
Total expenditures [1]	2,766	295	339	709	1,163	164	1,300	341	**7,077**
Total expenditures / students	**5.3**	**8.2**	**13.0**	**13.1**	**9.1**	**5.3**	**7.0**	**33.2**	**7.1**
Revenues	1,616	93	245	154	373	131	743	41	**3,395**
Total net expenditures [1]	1,150	202	94	555	790	33	557	300	**3,682**
Total net expenditures / student	**2.2**	**5.6**	**3.6**	**10.3**	**6.2**	**1.1**	**3.0**	**29.3**	**3.7**
Locations where program is offered:									
Alfred	✓	✓		✓			✓	✓	
Kemptville	✓		✓	✓	✓				
Guelph	✓				✓	✓			
Ridgetown	✓	✓			✓		✓		

[1] Utility and maintenance costs, normally included in infrastructure costs only at CollIge d'Alfred, have been removed to allow direct comparison to other Colleges. Net Expenditures represent total expenditures for program less the tuition revenue generated by student enrolment.
[2] Fall of 2003 is first year of enrolment for Turf Diploma Program at Guelph; final year enrolment in Agriculture & Horticulture at Guelph.
[3] 03/04 is a start-up year the Environmental Management Diploma Program.
[4] International Development is a specialization within the Agriculture Diploma at Alfred.

Table 2.3.8: 2002/2003 Value of Diploma Student Assistance

	Alfred		Kemptville		Ridgetown		Guelph		TOTAL	
	02/03	03/04	02/03	03/04	02/03	03/04	02/03	03/04	02/03	03/04
Student Awards ($)	35,470	32,475	41,075	56,875	53,099	43,000	57,085	50,822	186,729	183,172
Value of Awards ($) per student	284	304 [1]	184	224	147	108	159	226	175	186

[1] Number of students who received awards = 107 ($32,475 divided by 107 equals $304)

2.4 Business Development Training

X Activities for Business Development Training are funded through contracts and certificate courses (including residential programs of up to one academic year), with the objective of attaining cost self-sufficiency.

Table 2.4.1: Summary of Revenues and Expenditures (in thousand's of dollars) for Continuing Education/Business Development and Training Program

	Alfred[1]		Kemptville		Ridgetown		Total	
	02/03 Actual	03/04 Actual	02/03 Actual	03/04 Actual	02/03 Actual	03/04 Actual	02/03 Actual	03/04 Actual
Program Revenues:								
- program delivery	500	380	1,230	1,063	1,952	2,273	3,682	**3,716**
- academic support	18	52	8	8	-	-	26	**60**
- research support	196	181	-	-	-	-	196	**181**
- infrastructure & support	6	9	11	12	17	31	34	**52**
Total Revenue	**720**	**622**	**1,249**	**1,083**	**1,969**	**2,304**	**3,938**	**4,009**
Program Expenditures:								
- program delivery	451	402	1,171	1,196	1,781	1,905	3,403	**3,503**
- academic support	75	107	78	89	-	-	153	**196**
- research support	209	218	-	-	-	-	209	**218**
- infrastructure & support	145	145	197	215	222	227	564	**587**
Total Expenditures	**880**	**872**	**1,446**	**1,500**	**2,003**	**2,132**	**4,329**	**4,504**
Net:								
- program delivery	49	(22)	59	(133)	171	368	279	**213**
- academic support	(57)	(55)	(70)	(81)	-	-	(127)	**(136)**
- research support	(13)	(37)	-	-	-	-	(13)	**(37)**
- infrastructure & support	(139)	(136)	(186)	(203)	(205)	(196)	(530)	**(676)**
Net Surplus (Expense)	**(160)**	**(250)**	**(197)**	**(417)**	**(34)**	**172**	**(391)**	**(495)**

[1] For direct comparison across all locations, infrastructure costs at Alfred exclude the cost of utilities and maintenance ($135k in 02/03; $141k in 03/04).

Table 2.4.2: Student Days and Range of Fees/Student Day for C.E. Courses.

	Alfred		Kemptville		Ridgetown		Total	
	02/03	03/04	02/03	03/04	02/03	03/04	02/03	03/04
# of Student Days (6 hrs/day)	4,228	5,632	18,271	19,198	21,525	16,971	44,024	41,801
Diploma Student Equivalent[1]	35	47	152	160	179	141	367	348
Fees/day ($) [2]	30 - 600	30 - 600	75 - 95	75 - 140	80 avg.	50 - 200	30 - 600	

[1] Calculation: Divide number of student days by 120 (the number of days in a student year)

[2] This shows the range in course fee charges, per day, to provide some contextual comparison from year-to-year and location-to-location.

2.5 Veterinary Clinical Education Program

2.5.1 An Overview

The Veterinary Clinical Education Program (VCEP) Agreement provides annual base funding to the Ontario Veterinary College (OVC) to meet the continuing needs for:

- "veterinary graduates who have a high level of appropriate clinical experience in veterinary medicine to service Ontario animal owners";
- "an animal referral hospital which will service satisfactorily Ontario's veterinary practitioners and animal owners".

2.5.2 Objectives of the Program

A. Meet the accreditation requirements of the Canadian and American Veterinary Medical Associations as well as the College of Veterinarians of Ontario,

B. Provide the clinical education component for veterinary students in the Doctor of Veterinary Medicine undergraduate program,

C. Operate the Veterinary Teaching Hospital clinics including large animal, small animal, field service and diagnostic laboratories,

D. Offer a one-year post-graduate Veterinary Internship Program in the large animal and small animal clinics,

E. Offer an advanced clinical training program entitled Doctor of Veterinary Science (D.V.Sc.) in various medicine and health maintenance disciplines,

F. Offer an externship program of approved clinical experience with a private veterinary practitioner or a relevant public/private sector organization,

G. Offer referral and emergency veterinary services to Ontario veterinary practitioners and the animal-owning public. These include medicine and health maintenance services.

2.5.3 Resource Allocation

To meet the objectives of the VCEP agreement, VCEP funds were allocated to three programs; the Clinical Education Program (Objectives A to D and G), the D.V.Sc. Program (Objective E) and the Externship Program (Objective F). Table 2.5-1 summarizes the program's objectives, budget and expenditures. The total available VCEP budget in 2003/2004 was $4,696,785. For the year ending April 30, 2004 expenditures totalled $4,692,537 leaving a balance of $4,248. Of this budget; $3,896,046 went towards the Clinical Education Program (CEP), $549,703 to the D.V.Sc. program and $246,788 to the Externship Program.

The CEP portion of VCEP funded 11.86 faculty FTEs in the Departments of Clinical Studies, Population Medicine. These faculty positions support teaching and service in large animal

medicine and surgery, anaesthesia, dairy, beef, sheep and swine health management and theriogenology. It also supported 2 professional staff, 24 staff, 4 internship students and 5.5 staff veterinarians in the Veterinary Teaching Hospital.

The D.V.Sc. portion funded 26 of the College's over 45 D.V.Sc. students.

The Externship portion of VCEP provided support for the student relocation allowance, organizational support staff, operating expenses and insurance, needed to deliver the course. The latter 8 week fourth year course is generally taken during the spring semester and is compulsory for all DVM students.

Table 2.5.1: VCEP Budget and Expenditures for Core Strategic Programs by Objective: 2003/2004

Programs	Objectives [1]	Expenditures Compared to Budget 2002/2003	
Clinical Education	A Meet accreditation requirements B Provide clinical education component for veterinary students in the DVM Program C Operate the veterinary teaching hospital D Offer a one-year internship program G Offer referral and emergency veterinary services to practitioners and animal owning public in Ontario	Personnel Operating Costs Total ***Budget*** Balance	3,482,868 413,178 3,896,046 ***3,896,103*** 57
DVSc	E Offer an advanced clinical training program entitled Doctor of Veterinary Science	Support for DVSc's ***Budget*** Balance	549,703 ***549,703*** -
Externship	F Offer an externship program of approved clinical experience	Personnel Operating Costs Total ***Budget*** Balance	9,056 237,732 246,788 ***250,978*** 4,191
Grand Total		Total Expenditures ***Budget*** Balance	4,692,537 ***4,696,785*** 4,248

[1] See section 2.5.2 for complete objective descriptions

2.5.4 CLINICAL EDUCATION PROGRAM

In compliance with Objectives A, B, C, D, and G of the VCEP Agreement, the OVC delivers a Clinical Education Program. To support this program, VCEP funding is allocated in the VTH and the three academic departments involved in clinical education: Pathobiology, Clinical Studies and Population Medicine.

Clinical Education is the largest component of the VCEP agreement. This program supports the clinical training of DVM students within the VTH. Clinical experience is gained in the various VTH services that include clinics in the large animal and small animal areas, and a field service program. Additionally, the Hospital offers referral and emergency services to veterinary practitioners and the animal-owning public for 24 hours a day, 365 days of the year. One hundred and six students were enrolled in the final year program in 2003/2004

Objective A: Meet the accreditation requirements of the Canadian and American Veterinary Medical Associations (CVMA, AVMA) as well as the College of Veterinarians of Ontario (CVO).

Performance Measures and Targets

Objective: To meet the accreditation requirements of the Canadian and American Veterinary Medical Associations as well as the College of Veterinarians of Ontario;

Expectation: The OVC will maintain its accredited status with the CVMA/AVMA, CVO and AAHA indefinitely.

Measurement Instrument:

- DVM Program assessment by the Council of Education of the American Veterinary Medical Association (AVMA).
- Annual Report sent to Council on Education of the AVMA.
- Accreditation of relevant clinics of the Veterinary Teaching Hospital (VTH) by the College of Veterinarians of Ontario.
- Accreditation status of relevant sections of the VTH, small animal clinical facilities, personnel and equipment by the American Animal Hospital Association (AAHA).

2003/2004 Outcome:

The OVC was granted full accreditation after the AVMA Council of Education site visit in February 2002 for a period not to exceed seven (7) years.

The AVMA accreditation process was developed to ensure quality professional veterinary education. The process uses periodic accreditation reviews to determine the degree to which the College meets a described set of standards as well as its own stated mission and objectives. The AVMA standards are recognized globally. This accreditation is crucial for the OVC to maintain its international reputation, to recruit candidates, to serve its mandate of teaching, research and service and to subsequently train veterinarians to meet the needs of the Province of Ontario.

The College of Veterinarians of Ontario (CVO) administers the Veterinarians Act. One requirement for licensure in Ontario is graduation from an AVMA/CVMA accredited college. In addition, no person can provide service from a veterinary facility unless the facility is CVO accredited. The VTH could not legally operate its various clinics without CVO accreditation. A

site visit and inspection was conducted by the CVO in February 2002, with the next inspections scheduled for 2007. The VTH met all accreditation requirements for the small animal, food animal and mobile units.

Objective B: Provide the clinical education component for veterinary students in the Doctor of Veterinary Medicine undergraduate Program.

Outcome assessment is now an integral part of the AVMA accreditation standards. In addition to the performance measures of the VCEP agreement the OVC has established additional performance measures to monitor student performance with a view to ongoing enhancement of its programs.

Performance Measures and Targets

Objective: To determine the degree of employer's satisfaction with new DVM graduate's performance in the workplace within the first year after graduation

Expectation: That greater than 80% of employers surveyed will express satisfaction with New Graduate Performance in the Workplace during the first year following graduation from the OVC.

Measurement Instrument: Employer Questionnaire

Employers with a new graduate of OVC '03 received questionnaires in August 2003. The response rate to this survey was 71%. In response to the question of the OVC '03 employee's overall performance/competence at this time (after working in the position for several weeks) to do the job for which he/she was hired, employers rated 95% of new graduate performance as Superior, Very good or Good and the remainder as Poor. "Poor" performance was defined as marginal but acceptable performance and "Very Poor" performance as unacceptable or unsatisfactory performance. Of the employers who responded to the questionnaire, 5% rated their New Employees Performance as "Poor" or marginal.

2003/2004 Outcome:

Surveys of employers who hired graduates of the Class of OVC '03 revealed over 90% satisfaction with their employee's overall performance/competence 3 – 5 months after graduation, to do the job for which they were hired.

Summaries of the data on which these comments are based are available on request.

Objective: **To determine OVC graduates' perception/assessment of their preparedness for the job opportunities and responsibilities encountered in the workplace**

Expectation: That greater than 80% of the graduates surveyed would express satisfaction with their performance in the workplace during the first year following graduation from OVC.

Measurement Instrument: New Graduate Survey

Mailed questionnaires comparable to the Employer Survey referred to above, comprised of five multi-section questions and three open-ended questions were mailed in August 2002 to each of the 100 members of the class of OVC '03. Seven surveys were returned unanswered, and of the remaining 94, sixty-four replies were received (a response rate of 68%). Ninety-six percent of the new graduates assessed their performance in the workplace as "Superior", "Very Good" or "Good" and 4% as "Poor" or marginal but acceptable.

Summaries of the data on which these comments are based are available on request.

2003/2004 Outcome:
One hundred percent of the Class of OVC '03 who responded to the survey were satisfied with their overall performance/competence, 3-5 months after graduation, to do the job for which they had been hired.

Objective C: Operate the Veterinary Teaching Hospital clinics including large animal, small animal, field service and diagnostic laboratories.

Performance Measures and Targets

Objective: To provide a reasonable volume of cases and teaching animals for student learning.

Expectation: A reasonably stable caseload of both client cases and teaching animals is maintained to allow instructors to teach with real clinical cases.

Measurement Instrument:
VTH statistics

2003/2004 Outcome:

Caseload in the Veterinary Teaching Hospital	2003/04	2002/03
Small Animal Client Admissions	12,567	12,554
Large Animal Client Admissions	1,986	2,086
Ruminant Field Service, Farm Visits	1,799	1,880

As shown above, the provision of on farm large animal services continues to be an area of emphasis.

Objective D: Offer a one-year post-graduate Veterinary Internship Program in the Large and Small Animal Clinics.

A one-year internship involves specialization in either the VTH's Small or Large Animal Clinics. Interns are usually new or recent graduates wishing to increase their level of discipline skills in an academic environment or to use this experience to help gain entry to more advanced graduate programs (i.e. D.V.Sc., Residency). Experienced veterinarians may chose an Internship to help them upgrade their level of knowledge or reorient their career path after some time spent in practice. The interns are paid a stipend of $21,000 per year. Currently VCEP funds support six interns. Revenue from the VTH funds an additional nine interns.

Performance Measures and Targets

Objective: To provide the graduate intern with a more competitive ability for acquiring a job, either in practice or in a residency program.

Expectation: At least 30% of the Interns that applied for residencies are successful in their application, and 70% of the Interns that applied to speciality practices are successful in their application.

Measurement Instrument: Exit Survey
At the end of the program VTH Interns are surveyed as to their employment location and type of job for the upcoming year. Success rate in terms of obtaining a Residency will also be obtained.

2003/2004 Outcome:
As of June 2004, ten (10) of thirteen (13) Interns were successful in obtaining residency programs and three (3) obtained employment in private practice.

Objective G: Offer referral and emergency veterinary services to Ontario veterinary practitioners and the animal-owning public. These include medicine and health maintenance services.

Performance Measures and Targets

Objective: To meet the mandate as a full-service veterinary referral/emergency resource for the Province of Ontario. This service includes both emergency referral and elective referral services. The emergency service is available for 365 days / year, 24 hours / day for all common domestic species.

Expectation: All emergency referrals and 95% of all elective referrals will be accommodated by the Veterinary Teaching Hospital. Specialty services will be available for referral by Ontario veterinarians.

Measurement Instrument:
VTH statistics

2003/2004 Outcome:

2003/2004 Client Referral Caseload		
	Small Animal Client Cases	**Large Animal Client Cases**
Elective	10,743	1,177
Emergency	1,824	809
Total	**12,567**	**1,986**

2003/2004 Specialty Service Referral Caseload			
Small Animal Clinic		**Large Animal Clinic**	
Chemotherapy	1,065	Colic Management	335
Radiation Therapy	369	Theriogenology	62
Nuclear Medicine Bone Scan	30	Foal Intensive Care	117
Cardiology	1,219	Cardiology	64
Ophthalmology	550	Bovine Surgery	39
Diagnostic Ultrasound	1,461	Diagnostic Ultrasound	377
Intensive Care	1,595	Nuclear Medicine Bone Scan	53
Neurology	931	Neurology	115
Dermatology	662	Respirology	123
Theriogenology	431	Diarrhea Management	53

2.5.5 Externship Program

In compliance with Objective F of the VCEP Agreement, the OVC delivers an Externship Program.

Objective F: Offer an Externship Program of approved clinical experience with a private veterinary practitioner or a relevant public/private sector organization.

Performance Measures and Targets

Objective: To assess progress in achieving stated learning objectives during the Externship Course.

Expectation: That a statistically significant improvement in mean clinical performance scores will be achieved in most categories tested over the course of the Externship Course.

Measurement Instrument: Interim and final evaluation questionnaires.
Joint interim and final evaluation questionnaires were used for this assessment. These questionnaires, which were completed by the externship student together with his/her Externship Course host, assessed 82 activities in large animal private primary care practice and 100 clinical activities in a small animal private primary care practice. Assessed activities included the ability to collect a relevant and accurate history, physical examination of an animal, formulation of a differential diagnostic problem list, development of a treatment plan and development of preventive strategies for common diseases and other problems encountered in domestic animals.

For the summer of 2003 (OVC '04) the improvement in students' clinical performance over the eight-week placement involved in the Externship Course was similar to that reported over the previous five years. Again, data collected for the class of OVC '04 reflected considerable consistency in the clinical capabilities of OVC students at the end of their third year of the professional program.
Some areas that did not show improvement did not do so because case numbers were too few. Summaries of the data on which these comments are based are available on request.

2003/2004 Outcome:
Statistically significant improvement in clinical performance scores was achieved in 168/182 of the categories or activities assessed.

Objective: To assess the extern's knowledge base and skills at the end of the Externship Placement.

Expectation: That 100% of the students will perform at a satisfactory ("C" grade) level or higher.

Measurement Instrument: Host Practitioner Evaluations.
Host practitioners evaluated their extern's clinical capabilities in terms of diagnostic process skills, delivery of veterinary care, technical skills and professional conduct at the end of the Externship Placement. Each student in the class (n=100) achieved a score of 80% or higher.

Copies of the assessment forms and the analyses are available upon request.

2003/2004 Outcome:
One hundred percent of the class of OVC '04 (Summer '03 Externship) performed at better than a "C" grade level.

2.5.6 D.V.Sc. Program

In compliance with Objective E of the VCEP Agreement, the OVC delivers the D.V.Sc. Program.

Objective E: Offer an advanced clinical training program entitled Doctor of Veterinary Science in various medicine and health maintenance disciplines.

Performance Measures and Targets

Expectation: At least 90% of the students will complete the program successfully in approximately three years.

Measurement Instrument: University of Guelph graduate student registration data

2003/2004 Outcome:
During 2003/2004 nine VCEP funded D.V.Sc. students completed the program. The mean time to completion for these students was 12.2 semesters or 4.2 years. Details of discipline, enrolment, and graduations are outlined in Table 2.5.6-1.

The normal duration of the D.V.Sc. program, and funding support, is nine semesters (three years). The College maintains the equivalent of one stipend in "reserve" to deal with one-semester extensions when needed to complete the thesis. Approximately one-third of the students receive this additional semester of support if a formal request is made by the faculty Advisor and Advisory Committee. The longer average time to completion of the D.V.Sc. Program during the past year is primarily related to two students who took 14 and 19 semesters to complete their Program. Their funding ended after 9 semesters, at which time they accepted full time employment. This seriously slowed completion of their theses. We do not encourage these delayed degree completions. An additional student first entered a Master of Science degree program before transferring to the D.V.Sc. program. The semester total of 13 for this student is really for the two programs, but all semesters are credited to the D.V.Sc. because the M.Sc. was not completed.

Table 2.5.6.1: D.V.Sc. Total New Students, Enrolment and Graduations During 2003/2004

Department	Discipline	New Students	Enrolment*	Graduations
Pathobiology	Anatomic Pathology	2**	7	2
	Clinical Pathology	1	2	0
	Zoo Medicine	1		
	Laboratory Animal Science	1		
	Other		7	1
	Total Pathobiology	5	16	3
Clinical Studies	Anesthesiology	1**		
	Companion Animal	3	9	4
	Large Animal	2**	6	2
	Other		7	2
	Total Clinical Studies	6	22	8
Population Medicine	Theriogenology	1**	2	1
	Health Management	2 (1**)	4	0
	Total Population Medicine	3	6	1
Biomedical Sciences	Total Biomedical Sciences	0	1	0
OVC Total		**14**	**45**	**12**

Table includes all new D.V.Sc. students for the period May 1, 2003 to April 30, 2004.

* Based on Winter 2004 enrolment. Actual enrolment varies slightly over the three semesters.

** VCEP supported students.

Expectation: Enrolment in the D.V.Sc. Program should be at least 20 students

Measurement Instrument: University of Guelph graduate student registration data

2003/2004 Outcome:
The College's D.V.Sc. program had 26 VCEP funded positions, (based on 2/3 VCEP, 1/3 MTCU agreed split) with the remainder funded from other sources. Table 2.5.6-2 includes all new D.V.Sc. students and graduates for period May 1, 2003 to April 30, 2004. During 2003/2004, 14 new students enrolled in the program.

Table 2.5.6.2 D.V.Sc. Graduate Student Placements 2003-2004

Department	Discipline	Graduate Placement
Clinical Studies	Small Animal Medicine	OVC VTH Private specialty practice, Florida Private Referral Practice, Toronto* Private Referral Practice, Montreal*
	Large Animal Surgery	OVC CS Faculty*
	Large Animal Medicine	OVC VTH*
	Cardiology	OVC CS Faculty*
	Ophthalmology	OVC CS Faculty*
Pathobiology	Avian/Exotic	Post Doc Fellowship, CFIA, Winnipeg*
	Anatomic Pathobiology	Staff pathologist, private diagnostic company*
	Zoo Medicine	Staff Vet. Copenhagen Zoo
Population Medicine	Theriogenology	OVC VTH*

Table inclues all graduate placements for the period May 1, 2003 to April 30, 2004.
* VCEP supported students.

3. LABORATORY SERVICES DIVISION

3.1 Highlights

- The Laboratory Services Division (LS) provides testing and diagnostic services in support of OMAF's regulatory and disease surveillance programs. In addition, LS is expected to generate sufficient funds to replace and upgrade its infrastructure, including facilities and technical capabilities. In order to generate reinvestment funds, LS provides testing services on a fee-for-service basis to government, universities and the veterinary and agri-food industry.

- The Animal Health Laboratory performed approximately 582,000 tests in support of disease surveillance while the laboratories at 95 Stone Road performed approximately 817,000 tests in support of the regulatory programs.

- During 2003/2004, activities focused on aligning methods with the Canadian Food Inspection Agency, and new capabilities. New programs for food testing were introduced. A water testing center was developed.

- The automation of the raw cow's milk program entered a new phase. Specifications were completed and the creation of the new system was underway by the end of the year. This project is being implemented in partnership with the Dairy Farmers of Ontario, the Ontario Dairy Council, the Ontario Milk Transporters Association, the Ontario Ministry of Agriculture and Food, and the Laboratory Services Division.

- Revenue from external clients increased to a record level of $11.0 million. The increase was due largely to a small number of large short-term projects. One of those projects, the testing program for the plum pox virus eradication project, ended after the 2003 season.

- Strong business development efforts coupled with cost containment allowed LS to reinvest $3.6 million in equipment and infrastructure. A large portion of the funds was allocated to analytical equipment although facilities upgrades and repairs are also included in that amount. The equipment improvements enabled LS to introduce the new testing capabilities that are required to support OMAF's programs.

3.2 Budget

The Laboratory Services Division (LS) provides testing and diagnostic services to public and private clients in the agriculture, food and veterinary industries. This report deals with those services that LS provides under the terms of the OMAF/U of G Agreement. The report describes the testing services provided to the Food Industry Division (FID) and the Agriculture and Rural Division (ARD) of OMAF and the diagnostic services carried out on behalf of the Livestock Technology Branch of ARD.

Under the terms of OMAF/U of G Agreement, the Laboratory Services Division receives funding for the specific testing services described previously. In addition, LS is required to earn sufficient additional income to replace and upgrade its infrastructure. To that end, LS provides

testing, on a fee-for-service basis, to various clients in the public and private sector. It is estimated that LS must reinvest at least $1.5 million per year in infrastructure replacement and upgrades in order to maintain the current level of capabilities to meet OMAF's testing requirements. This does not cover the needs for expansion of testing capabilities to deal with emerging problems and regulatory requirements. As needs evolve, additional investment is required to acquire the new technology to meet increasingly complex test requirements.

Financial Results (for the year ended April 30, 2004) ($ in '000)

	02/03	03/04	03/04
Expenditures	**Actual**	**Budget**	**Actual**
Animal Health Labs	5,300	5,700	5,300
Analytical Services	2,800	2,300	2,500
Regulatory Services	3,800	4,100	4,800
Infrastructure and Support	2,800	2,800	2,700
Reinvestment	2,500	4,000	3,600
Total Expenses	**17,200**	**18,900**	**18,900**
Revenue (external clients only)	9,000	8,800	11,000
OMAF Funding	9,000	9,000	9,000
Carry forward surplus & other funding	300	1,300	1,300
Total Funding	**18,300**	**19,100**	**21,300**
Surplus/(Deficit)	1,100	200	2,400

- Revenues from external sources reached a record of $11.0 million. A large portion of the external revenue is due to short-term projects. It is notable that this year the revenue from projects was significantly higher than anticipated and this level of activity is not expected to be sustained over the long term.
- LS reinvested $3.6 million in upgrades to facilities, equipment and improvement projects and method development. This amount includes purchases that were approved in the previous year but paid for during the current year.
- The combination of higher than anticipated project activity and good management of costs resulted in a planned surplus of $2.4 million. The ability of LS to earn revenue and generate reinvestment funds varies from year to year. LS cannot guarantee to generate reinvestment funds in the same year that it may incur an infrastructure or equipment cost. The surplus funds have been set aside to cover costs for equipment and infrastructure that are anticipated in approximately two years.

3.3 Performance Measures

Under the terms of Schedule K of the OMAF-University of Guelph Partnership Agreement, the Laboratory Services Division (LS) is expected to provide OMAF with laboratory services that address OMAF's program needs. The OMAF program manager defines the quantity and type of testing to be done for the regulatory programs. Each year the respective program manager provides LS with a sampling plan. The sampling plan varies from year to year. New or modified testing programs were introduced for cream and goat milk testing, monitoring of beta agonists and non-steroidal anti-inflammatory drugs, and chemical residues and microbiological testing for minimally processed food of plant origin. Since the animal disease surveillance program is based on a passive system, the actual number of tests is not defined but a target volume has been established. A primary measure of performance under the agreement is the ability of LS to deliver the required volume and type of tests specified in the timeframes required.

In addition to providing ongoing services, LS provides emergency support to OMAF. This year there were two emergency investigations related to potential food contamination.

The AHL performed approximately 582,000 procedures under the passive disease surveillance program. Veterinarians who use the OMAF supported service were surveyed. 96% of the respondents rated the service as satisfactory or better, while 4% of the respondents did not rate the service. In other words all respondents that rated the services found them satisfactory or better.

The LS also carried out the scheduled testing programs described under the performance management agreements for plants, soil and water and for food. A total of approximately 817,000 procedures were completed. The program managers who use the testing service were surveyed and 100% rated the service as satisfactory or better.

There is an expectation that LS will generate sufficient income to finance infrastructure upgrades that support technological improvements in the testing services. LS was able to re-invest $3.6 million in infrastructure upgrades and in addition was able to set aside a surplus of $2.4 million for anticipated future needs.

The scope of testing was expanded significantly to meet clients emerging needs. Concerns about the impact of veterinary drug residues on human health continue to drive the need for studies and monitoring of drug residues in the food supply including fish. New methods were developed to detect and confirm chemical contaminants in the food supply. Existing methods were expanded to new matrices. This activity is required for LS to be eligible to provide support for OMAF baseline studies. It is also required so that LS is in a position to support changes in the regulatory programs that may result from the baseline studies. In support of the expansion of chemical residue testing, two new high-end liquid chromatograph/ tandem mass spectrographs (LC-MS/MS) were purchased.

The Animal Health Laboratory continued to expand virology testing with an emphasis on rapid analysis based on DNA or RNA and the ability to identify viral types. A second LightCycler was purchased for the Animal Health Laboratory. Rapid diagnostic testing is important to producers and viral typing information is important to disease surveillance. Twenty-three new procedures were introduced. A screening program for Johne's disease was introduced.

There is an expectation that LS will maintain quality programs. LS is audited for ISO compliance on a yearly basis and continued to maintain its ISO9001:2000 status. The Animal Health Laboratory continues to be accredited by the American Association of Veterinary Laboratory Diagnosticians.

3.4 Reinvestment ($'000's)

The table below details key reinvestments made in 2003/2004. A detailed inventory of equipment including all new acquisitions is submitted to OMAF on a yearly basis. Major acquisitions are noted in the table. The first priority for equipment re-investment is given to the replacement of failing equipment that supports an ongoing program or infrastructure repairs that are program related. The second priority is given to new technology that is required to support ongoing programs into the future.

Reinvestment Item	Amount *(in million's of dollars)*
LC-MS/MS*	0.7
LC-MS/MS	0.6
4 gas chromatographs	0.4
DNA Sequencer	0.2
Incinerator repairs (Kemptville)	0.2
Dairy sample system	0.1
LightCycler	0.1
Nucleic acid prep station	0.1
AQ2 automated analyzer	0.1
Other (less than $70,000)	1.1
Total	**$3.6**

*liquid chromatography tandem mass spectroscopy instrument

3.5 Improvement Projects

Laboratory Services is committed to continuous improvement and the continual evolution of technology and systems in support of effective testing services. LS has committed funds to both short-term and long -term improvement projects.

With the assistance of an external consultant, the processes that support the flow of work throughout the Animal Health Laboratory were mapped and opportunities for improvement were identified. This project resulted from an earlier examination of the sample receipt and data handling functions. Some of the recommendations are contingent on changes to the laboratory information system and will be deferred in the short term.

In cooperation with the Dairy Farmers of Ontario, the Ontario Dairy Council, the Ontario Milk Transporters Association and OMAF, the Laboratory Services Division began the process of automating the sample and data management for the raw cow's milk quality and composition testing program. This project includes developing new information technology tools. It is a major project that is estimated to cost LS approximately $250,000. It is expected that the entire

province will move to the new system in the fall of 2004. By the end of fiscal 2003/2004, specifications had been documented and software was being developed. The project will streamline the sample management, improve the flexibility of the testing to accommodate new requirements and provide additional information to both industry and OMAF to support decision making.

A laboratory was set up for specialized water testing. This was done in response to increased requests from commodity organizations and processors for the microbiological testing of water used in agricultural processes.

The annual Fee Schedule for the Animal Health Laboratory was revised to include basic information on the use of lab tests as an investigative tool including interpretive ranges. This expanded format will assist veterinarians with test ordering decisions and improve the utilization of laboratory resources.

3.6 Accommodation and Planned Upgrades

Animal anatomical waste disposal remains a pressing problem for the AHL. The incinerator at the Kemptville laboratory site was repaired. A contract is in place for the removal of waste material to a commercial incinerator and this method of disposal was used in order to keep the Kemptville laboratory operating while repairs were made. Discussions continue about the plan for replacement of the incinerator on the Guelph campus.

The AHL continued to participate in planning for a new building to be occupied by the Department of Pathobiology and the Animal Health Laboratory. The current space was documented and space requirements were evaluated. The plan does not include an expansion of the AHL laboratory space to allow for surge capacity but it does allow for better bio-containment and security.

The phone system at 95 Stone Road was reviewed and a new system was selected. The old system is obsolete and considered a barrier to communication with Laboratory Services clients. A new system was chosen to be compatible with the new system that is being installed by the University of Guelph. Facilities changes were made to accommodate the new phone system at 95 Stone Rd but the phone system will be installed in 2004/2005. This is considered a program expense.

During August of 2003 there was a province wide power failure that impacted on the operation of the Laboratory Services Division. The building at 95 Stone Rd is equipped with an emergency generator and backup systems were in place for critical storage at the AHL. Using a combination of resources on campus and within 95 Stone Rd the Laboratory Services Division was able to protect critical samples, keep losses to a minimum and maintain communication channels. There were no lasting negative effects as a result of the incident and service was restored quickly.

3.7 Quality Assurance

The Laboratory Services Division subscribes to a number of external quality management programs as a means of supporting its internal quality assurance procedures. Some of these are general in nature and some are specific to a service. As part of the external program LS is audited

on a regular basis. LS is currently registered as an organization that maintains a general quality management system that is consistent with ISO 9001:2000, an internationally recognized standard for quality management. The trace organics and pesticide laboratory is currently accredited by the Standards Council of Canada as a GLP (good laboratory practices) testing site for pesticides. This designation is a requirement for laboratories that are performing testing for the purpose of registering a pesticide with the federal government. This is a highly specialized designation that does not apply to the work that LS does for OMAF. The AHL is currently accredited by the American Association of Veterinary Laboratory Diagnosticians. This US based accreditation is available to public sector veterinary laboratories. It covers general quality management practices. This is a voluntary accreditation involving peer reviews and is meant as a quality improvement tool.

In addition to these general programs individual methods may be accredited to an ISO 17025 standard by various agencies, including the Standards Council of Canada and the Canadian Association of Environmental Analytical Laboratories. Individual method accreditation varies with time and the list is extensive. The complete current listing can be found on the web sites for the organizations listed above.

3.8 Research Activities & Innovation

3.8.1 Research

While Laboratory Services is not a research unit, it does carry out method development and validation projects. Most of these are financed through income earned by LS through the sale of various services. In addition, scientists as LS may obtain grant funds for specific projects. During 2003/2004, the following research projects were active:

- Improvement and validation of a DNA microchip-based test for rapid and simultaneous detection of six food-borne pathogens in food samples ; S. Chen; ended June30, 2003
- Development of an analytical method for the confirmation of sulfonamides in animal tissues; L. Spilsbury; ended Sept. 21, 2003
- Development and validation of a screening protocol for identifying sulfamethzine-vilative swine carcasses at Ontario abattoirs; M. Mitchell; ended May 31, 2003
- Evaluation of the specificity and sensitivity of the immunocard STAT!E. coli O157:H7 assay for the detection of Escherichia coli O157:H7 in foods; J. Odumeru; ended Aug. 30, 2003
- Mycobaterium avium subspecies paratuberculosis in the Ontario dairy industry: strategies for detection of the bacterium in dairy products; L. Mutharia & J. Odumeru; ended Oct. 3, 2003
- Johne's disease – new test validation; M. Archambault; ended Nov. 18, 2003
- Application of the impedance and colorimertic systems for rapid and cost effective detection of Listria species in food and environmental samples; J. Odumeru; ended Feb. 1, 2004
- Development of a novel protein chip-based test for rapid and cost evfective salmonella serotyping; S. Chen; ended June30, 2004

- Development of a robust DNA preparation method to enhance simultaneous detection of multiple pathogens in foods by a microarray-based assay; S. Chen, ongoing

- Determination of the functional components (value-added) of Ontario grown soybeans, soybean oils & their by-products for the purpose of developing value-added products ; C. Jackson; ended Feb. 28, 2004

3.8.2 Innovation

There is an expectation under the general terms of the contract that Laboratory Services will generate sufficient funds to replace equipment and to introduce new technology so that over time its capabilities will keep pace with technological change. During 2003/2004, LS was able to reinvest in both replacement and new technology. Some of the more notable investments are as follows:

LS continued to build capabilities in the area of high-resolution mass spectroscopy with the acquisition of two high-end liquid chromatography units with tandem mass spectrometers that will support the development of new methods for the detection and quantification of pesticide and drug residues. This technology is rapidly becoming the gold standard for confirmation of presence of chemical contaminants and in particular veterinary drug residues.

A second LightCycler was purchased to support rapid virology testing based on real-time PCR technology. This technology is replacing conventional thermocyclers as the technology of choice for rapid PCR testing. Over the past two years, the AHL has been building a core capability in rapid PCR testing and virus genotyping. This core capability will provide rapid results to industry in the short term and provide better information for disease surveillance in the medium term. It also builds capacity to deal with an emergency response involving a zoonotic disease.

3.8.3 New Capabilities

The Laboratory Services Division is continually updating testing capabilities to match emerging needs. A major increase in the scope of testing was completed late in the previous year. During 2003/2004 LS continued to work with their counterparts in other government laboratories to align methodologies so that data can be compared.
The following is a partial list of the new methods that were introduced this year.

Animal Health Laboratory New Tests
Avian adenovirus, PCR
Avian adenovirus, phylogenetic analysis
Avian influenza virus, real-time RT-PCR
Avian reovirus, sequencing
BLV, ELISA
Brachyspira pilosicoli, PCR
EEEV, RT-PCR
Erythropoietin
Giardia, antigen ELISA
IHC – IBRV
IHC - influenza A virus
IHC - pig respiratory panel
IHC - PRRS virus
Influenza A, antigen ELISA
M paratuberculosis, culture
M paratuberculosis, PCR
Newcastle disease virus (NDV) phylogenetic analysis
NDV, RT-PCR
PRRSV, IgG indirect FA
Swine influenza virus A, antigen ELISA
Swine Influenza H3N2, HI
Vitamin E, serum

Chemical Residue Tests

Sulfamethazine in milk by HPLC (to include goat milk)
Tetracylcines in animal and fish tissue by HPLC
Beta-lactams in milk by HPLC (to include goat milk)
Oxolinic acid in fish by HPLC
Furazolidone metabolite in tissue by HPLC
Nitrofurans in tissue of animals and fish by HPLC
Sulfonamides in animals and fish by HPLC-Fluorescence
Patulin in apple cider by HPLC (modified to lower detection limit)
Single method for aminoglycoside (6 compounds) family in tissue
Single method for macrolide (4 compounds) family in tissue
Single method for beta-lactam (3 compounds) family in tissue
Single method for ionophore (3 compounds) family in tissue
Confirmation of tetracycline (4 compounds) family by LC MS-MS technology

Microbiological Tests

Biotyping for Campylobacter jejuni, Campylobacter coli and Campylobacter lari
Detection and Enumeration of total aerobes, Escherichia coli and coliforms in beef
Detection of Listeria in environmental samples by BioSys instrument
Enumeration of Listeria monocytogenes using a most probably number technique
Detection of Escherichia coli O157:H7 by the ImmunoCard Stat technology
Automated immunogenic separation method for detection of Salmonella species in food and environmental samples
Biotyping of Campylobacter

Plant Pest Diagnostic Tests

The following new tests have been introduced based on ELISA technology,

Blueberry Scorch Virus
Bean Pod Mottle Virus
Maize Dwarf Mosaic Virus
Melon Necrotic Spot Virus
Pepper Mild Mottle Virus
Raspberry Bushy Dwarf Virus
Sugar Cane Mosaic Virus

In addition a PCR based test for Xanthomonas camestris pv. vesicatoria was introduced

3.9 Services Provided to OMAF

3.9.1 Food Industry Division Programs

The testing services provided by Laboratory Services support the provincial Milk Act, Meat Inspection Act, Edible Oils Products Act, Farm Products Grades and Sales Act and the Food Safety and Quality Act, 2001. The volume and type of testing is determined by the appropriate OMAF program manager. The tests vary in complexity from a milk fat analysis to a broad-based pesticide residue screen. Approximately 817,000 tests were performed in support of the food safety programs. New or modified testing programs were introduced for cream and goat milk testing, monitoring of beta agonists and non-steroidal anti-inflammatory drugs, and chemical residues and microbiological testing for minimally processed food of plant origin.

In the previous fiscal year, OMAF and the dairy industry gave LS tentative approval to redesign the sample and data management system for the raw cow's milk program. LS is the lead organization for this major project. The project is being done in cooperation with the Dairy Farmers of Ontario, the Ontario Dairy Council, the Ontario Milk Transporters Association and OMAF. The project involves automation of information collection at the farm site, a new process for managing samples and the transfer of data between the Dairy Farmers of Ontario and Laboratory Services. The new system will simplify the sample and data collection process, improve the quality of information available for decision making and increase the flexibility of the program to deal with new requirements. This project is expected to cost $250,000. It is an example of an upgrade to OMAF programs that is financed from reinvestment funds generated by LS. During 2003/2004 the specifications were developed for the new tools and programming was initiated. The new system is expected to be implemented province wide in the fall of 2004.

The goat milk testing program was expanded. The goat milk industry set up a program for testing quality and composition in cooperation with OMAF. LS has been asked to provide the testing services and to facilitate the data capture and the communication of results across a number of stakeholders.

Under the agreement with OMAF, the Laboratory Services Division provides emergency response services to OMAF. LS supported two emergency response investigations.

3.9.2 Agriculture and Rural Division and Federal-Provincial Agreements

Laboratory Services provides support for plant diagnostics and soil mapping, as well as, environmental testing in support of the Great Lakes initiative. The volume of testing depends upon OMAF or Ministry of the Environment program activities. During 2003/2004, 554 procedures were performed in support of these programs.

3.9.3 Livestock Technology Branch

Laboratory Services supports the disease surveillance activities of Livestock Technology through the Animal Health Laboratory (AHL). AHL provides a full range of diagnostic services to veterinarians who support the poultry and livestock industry. AHL's main activity is to provide accessible, highly reliable, and cost-effective diagnostic testing that includes a broad scope of

tests. Data generated as a result of the diagnostic testing are made available to the Veterinary Science group within OMAF for the purposes of analyzing trends and identifying emerging diseases or urgent issues. AHL also supports the federal Health of Animals Act as a primary source of information on reportable diseases.

During 2003/2004, the AHL processed approximately 37,000 cases under the disease surveillance program. The lab completed 582,091 procedures on food producing animals under the OMAF disease surveillance program. The volume of cases and procedures is similar to the previous year.

The AHL continued to develop molecular-based testing procedures (PCR) for the rapid assessment of microbial diseases and to build on its ability to perform phylogenetic analysis. The latter is important to establish genetic relationships within a family of microbes. This information supports disease surveillance and strategies for immunization.

3.9.4 Related Provincial Programs Not Covered by the Agreement

The AHL continued to support an enhanced BSE surveillance program based on a separate agreement with OMAF. The AHL uses the same resources to support testing for chronic wasting disease in elk and deer. Throughout the year, discussions have taken place with OMAF and the Canadian Food Inspection Agency regarding ongoing requirements for BSE testing. The AHL is well positioned to play a key role in the continued surveillance of BSE.

Laboratory Services was contracted, through AGRICORP, to provide testing services in support of a federal-provincial initiative to eradicate the plum pox virus from Ontario orchards. In this, the final year of the testing program, the testing volumes far exceeded expectations.

4. OTHER OMAF/U OF G AGREEMENT PERFORMANCE MEASURES

In addition to the primary areas covered by the OMAF/U. of G. Agreement (research, Diploma education, Veterinary Clinical Education Program, and laboratory services), there are several other Performance Management Agreements (PMAs) that require reporting as part of the Annual Report. The objectives, performance measures and results for these PMAs are itemized below.

Reporting (Finance and Business)

Budget
The University must annually present the budget to OMAF for the Research, Diploma Education and Training, Veterinary Clinical Education Program (VCEP) and Laboratory Services programs. The University was delayed in presenting the 2004/2005 budget to the Executive Committee until July 6 due to extra time required to implement budgetary reduction measures in the MTCU portion of the University budget, which included awaiting the outcome of a Voluntary Early Retirement program offered to University employees, and which OMAF-supported staff could take advantage of.

Quarterly Management Reports
The University is to submit financial management reports to OMAF within 6 weeks after the end of each quarter for the Research, Diploma Education and Training, Veterinary Clinical Education Program (VCEP) and Laboratory Services programs. In addition, a Transfer Payment report is to be filed each time. The University maintained compliance with this PMA in 2003/2004.

Business Plan
The University is to submit a business plan covering the four programs (Research, Diploma Education, VCEP, Laboratory Services) each year, encompassing a brief description of each program and sub-programs, changes required or anticipated to the program relative to the previous year, new partnerships being or to be developed, staffing changes that could impact on the deliverables under the Agreement, and facility accommodation issues. Aside from the delayed submission of the budget noted above, the University met this deadline in 2003/2004 by submitting the draft business plan (excluding the budget) to OMAF on March 15th.

Trust Funds
The University is to submit reports on the **'Post-Retirement'** and **'Non-Pension Post-Retirement'** trust funds, as well as the **'Agreement Research Trust Fund'** (formerly the 'Partnership Research Trust Fund'), along with the quarterly management reports. The University maintained compliance with this PMA in 2003/2004.

Physical Facilities and Assets
This section includes PMA's pertaining to:

- Annual reporting on **space utilization and rationalization**
- Submitting budgets and reporting annually on **operations and maintenance**, and updating of Schedule T as required
- Review of facilities, including annual submission of **facility deficiency reports** and plans for addressing short, medium and long-term deficiencies.
- Reporting **sub-tenancies**, annually
- Submitting annually an **Asset Inventory and Planned Disposition Report**, detailing date of acquisition, asset value, ownership, condition, items sold, traded in or otherwise disposed of and revenues generated; intended dispositions and/or replacements for the coming year, and

livestock inventories. With the exception of the livestock inventories (which are reported within this Annual Report), each of these entails reporting dates other than with the Annual Report. The University attained compliance with all of these PMA's in 2003/2004.

Emergency Preparedness / Environmental Health and Safety

Emergency Preparedness Plan (PMA #6 under Physical Facilities and Assets)
The University is expected to maintain the Emergency Preparedness Plan, including provisions for review and update as required.

Health and Safety Management
The University is to maintain a Safety Management System for all locations regarding compliance with relevant legislation, training requirements for all staff and students, record keeping and communication requirement and other health and safety provisions, with a goal of zero lost-time accidents.

Environmental Management
The University is to ensure Environmental Management Plans are in place for all locations covering compliance with relevant legislation, management of incidents, identification of hazards associated with the programs, record keeping and communications, with a goal of zero incidents (spills, contamination, etc.).

The University's Environmental Health and Safety (EHS) department is responsible for the development and implementation of occupational health and safety and environmental protection policies, programs and initiatives. The University's Safety Policy Manual for Risk Management and Due Diligence (at www.uoguelph.ca/HR/ehs) contains all of the institution's safety policies and outlines safety program details. The University promotes the internal responsibility system for workplace safety management and regulatory compliance. EHS provides advice and services in this regard to members of the University community. In particular, front-line managers and supervisors are provided support and guidance for workplace safety performance and due diligence.

The University has an incident reporting policy (i.e. safety policy number 851.04.02 titled Injury and Incident Reporting) and an Emergency Response Plan (ERP). The University's Security Services Department co-ordinates emergency response actions and up-dates the emergency contact lists and response action plans on an on-going basis. All workplaces are required by institutional policies to have fire safety plans and local emergency procedures.

During the period of time covered by this report, the five lost time incidents were reported from OMAF research stations and Colleges. These incidents included an overexertion, a trip and fall, and contacts with equipment or animals. All employees returned to work following lost time ranging from one to twenty-three days.

During this period there were no environmental incidents.

No extraordinary problems were experienced related to health and safety at the University of Guelph campuses or stations as a result of the power failure that occurred throughout southern Ontario on Thursday, August 14, 2003.

Christi Cooper, Industrial and Agricultural Safety Officer, has primary responsibility for

co-ordinating EHS involvement with safety program and training initiatives at OMAF-related facilities, and for promoting the internal responsibility system and safety culture at the Agricultural Colleges and affiliated research stations. Christi provided the following updates pertaining to safety activity:

Training courses were organized and delivered for OMAF research station and College personnel covering various safety topics including: WHMIS, due diligence, vehicle and trailer safety, confined space entry, and forklift operator certification.

In February 2004, Geoff Byford left EHS and joined the Office of Research as Director, Research Risk Management. Chris White was recruited as the new Director of Environmental Health and Safety. These administrative changes further attest to the University's commitment to prioritize the importance of both risk and liability management and health and safety performance in day-to-day operations.

Indemnity and Insurance

The University is required to submit certificates of all types of insurance to OMAF at the execution of the Agreement and submit renewal certificates as needed. The University has submitted the certificates in compliance with this PMA in 2003/2004.

Non-OMAF Funding for Infrastructure

Awards were received in 2003/2004 for over $30.5 million in non-OMAF funding for research infrastructure related to the OMAF research program objectives. A number of these funding awards were combined CFI (Canadian Foundation for Innovation), OIT (Ontario Innovation Trust) awards and matching contributions. Two major awards were received through Round 4 of the Institutional Innovation Program.

Description of Award	Sponsor(s)	$ Amount
Combined set-up for the study of macromolecular assemblies in novel and improved food products (M. Corredig, Food Science)	CFI/OIT/matching	$367 K
Integrated facility for biology and molecular biology of plant viruses, virus diagnosis and genetic engineering of fruit crops for multiple virus resistance (B. Meng, Microbiology)	CFI/OIT/matching	$311 K
Infrastructure for population genetics and molecular epidemiology of veterinary and zoonotic pathogens (P. Boerlin, Pathobiology)	CFI/OIT/matching	$313 K
Development of a plant gene expression laboratory and nascent plant architecture informatics facility (J. Colasanti, Molecular Biology and Genetics)	CFI/OIT/matching	$299 K
Development of an environmental genomics laboratory and plant bioinformatics facility (L. Lukens, Plant Agriculture)	CFI/OIT/matching	$312 K
Infrastructure for studies of the genomics, evolution and ecosystem consequences of plant physiological traits (H. Maherali, Botany)	CFI/OIT/matching	$318 K
Genetic Improvement of Prunus species through plant biotechnology (J. Subramanian, Plant Agriculture)	CFI/OIT/matching	$299 K
Infrastructure for integrating genomic and evolutionary research (B. Husband, Botany)	Institutional Innovation Program	$10,097 K
State-of-the-art facilities for biophysical research on membrane functions in disease and natural environment interactions	Institutional Innovation Program	$18,274 K

4.1 Intellectual Property

Research discoveries and results are disseminated in several ways. One way is termed knowledge dissemination, which generally consists of traditional publications in scholarly and industry journals, conferences, seminars, teaching, theme-based bulletins, internet websites, etc. where the goal is to promulgate the findings as broadly as possible, for the general benefit of the scientific community and society at large.

A second form of dissemination is commercialization, which recognizes the economic potential of knowledge. Commercialization relies on intellectual property ("IP") – research discoveries which are protected in such a fashion to as to become intangible property that has a transferable value. Examples of such forms of IP protection include copyright, patents, plant breeder's rights, industrial design registrations, trademarks, etc. A trade secret can also be a legitimate form of protection (e.g. the formula for Coca-Cola is a well known example), but it is not compatible with a requirement or imperative to publish full research methodology and results so is a less frequent form of protection in an academic setting.

The typical stages of IP commercialization are research discovery, disclosure, evaluation and prior art search, protection and marketing, then licensing and possibly new company formation. In a number of instances, options are built into research contracts (or negotiated contemporaneously with the research collaboration) such that the marketing phase is abbreviated. In others, the evaluation phase may involve discussions with companies in a particular market segment such that a potential receptor company is identified early on, which can also expedite marketing. More commonly protection precedes marketing and commercial transfer, and to that extent, intellectual property protection is inherently speculative. In no case is a discovery disclosed in enabling form unless first protected by IP filing or under a confidentiality agreement.

Not all IP is successfully commercialized. The Association of University Technology Managers ("AUTM") has stated that the average patent makes less than $10,000. When one takes into account the value of some highly successful patents and the fact that a US patent today costs $25k, the implication is that most patents are either NOT successfully marketed, or the companies to which they are initially licensed are not successful in commercializing the discoveries. Some of the reasons for such lack of success were listed in last year's report, but bear elaboration. Please note that the following are not mutually exclusive:

1. Discoveries are too early stage – a significant discovery, but substantial further development money and time is required for a salable application or product
2. "Submarine" prior art is discovered at a later date – another inventor filed a patent first which was not found in the initial prior art search because patent offices do not publish applications for 18 months, because the title/description was intentionally obscure, the filing location was uncommon, or simply because the searcher was inexperienced.
3. Methods which are incremental in nature, address only a subset of the problem encompassed by the dominant technology or which generate insufficient expected return (either by increased revenue or lowered expenses) are less likely to generate company investment.
4. Methods which are a) easily infringed upon without discovery (virtually anything where the discovery is part of the production process, but not determinable by examination of the product sold), or b) which can be practiced in another country (with weak or permissible protection laws) and the data imported to the target market without infringement (e.g. drug discovery methods) are generally not very valuable due to cost versus enforcement issues.
5. Methods with sufficiently narrow claims that they stimulate successful attempts by others to create new (non-infringing) ways of accomplishing the same thing. This can also be true of products, e.g. inhibitors or agonists where mechanisms of action are poorly understood.

6. Companies judge regulatory/consumer acceptance hurdles and associated costs too high for expected return (often an issue with transgenic technologies, sometimes the same as "too early stage", but in a market rather than scientific sense)
7. Marketplace or company receptor(s) have too many competing technologies – may bet on another technology or may decide to "wait and see" which is most likely to survive.
8. Where valuable product claims are not fully enabled by the initial research discovery – further research is required to develop actual products. This is frequently true of research tools, which would include target discoveries (e.g. cell receptors, metabolic pathway enzymes, chaperone proteins, etc.), a traditional university strength. For example claims for small molecule agonists and antagonists of such targets are unlikely to be granted in the US unless the filer has actually discovered such entities due to recent court decisions. It is rarely the same researcher who both discovers the target and creates and optimizes the chemical entity to act upon the target.
9. Patent not strong enough – generally one or more of above or claims are restricted for lack of enablement.
10. A competing technology emerges which is easier, more effective/efficacious, less costly, better exploits existing channels of distribution or is developed more quickly so gains dominant market share.
11. Product ahead of its time – usually can't find a receptor with the clout or capital to either create a market or build channels of distribution.
12. Product not marketed on a timely basis delaying development and giving more quickly developed competing technologies time to gain market share or allowing technology to become "stale".
13. Researcher leaves institution, changes research focus or becomes frustrated by time to development such that needed improvements are never made.
14. Company doubts institution or researcher commitment to creating necessary improvements.

Management and Financial:

Germplasm management is unique because it truly represents a partnership between OMAF and the University. For plant cultivars, OMAF/ARIO acts as an agent for the University of Guelph in the payment of eligible costs and in the collection and distribution of royalties and license fees. For other germplasm, the University pays costs and collects and distributes licensing revenues. In both instances, the University manages IP protection, if any, and licensing agreement negotiation.

In part this division of responsibilities represents a historical development in that OMAF/ARIO once funded 100% of cultivar development and handled commercialization of these – today most cultivars are co-developed. Many of the historical procedures are still in place today – including those for disclosures, protection and financial activity reporting, which is based on OMAF's fiscal year end of March 31st, rather than the University's fiscal year end of April 30th. Accounting for cultivar germplasm is performed by OMAF staff during each OMAF fiscal year. After the end of such fiscal year, royalty splits and expenses are jointly agreed upon/reconfirmed by OMAF and University staff and payment is made by OMAF to the University for its share of royalties, less expenses. Typically this payment is received after the University has closed its books for the equivalent fiscal year such that on the University's books net income is one year in arrears. The following table illustrates the treatment of net revenue (year references are to fiscal years) for germplasm.

Table 4.1.1 Germplasm Royalties

OMAF Year	Royalty Net Revenues	OMAF Share	U of G Share	U of G%	U of G year received
2001/2002	$457,726	$326,658	$131,068	28.6	2003
2002/2003	$344,873	$239,560	$105,313	30.5	2004
2003/2004	$415,074	$264,332	$150,742	36.3	2005

Gross revenues have dipped in recent years due to issues associated with maize titles (now resolved) and delays in introducing new soybean cultivars. With some of the newer disclosures, gross revenues appear now poised to grow. Of the most recent year, horticultural cultivars were responsible for 8.3% of gross revenues; field crops 91.7%. Soybean cultivars alone represented 56.9% of gross revenues, with cereal crops as a whole a distant second at 12.7%. Expenses tend to be nominal for plant cultivars – they totaled $6,241 for the year ended March 31, 2004 (University share $591) and $742 for the germplasm year ended March 31, 2003 (University share $244).

It should be noted that the University's percentage share of germplasm revenues is slowly growing, representing increased use of non-OMAF sources of funding. The University's responsibilities for germplasm are primarily managed by a faculty member in the Plant Agriculture department who is a breeder himself and who spends 25% of his time on this activity. He has been involved in these responsibilities for 3 years.

Non-germplasm intellectual property is managed primarily by full time Business Development Office ("BDO") staff. In fiscal 2003, 75% of the BDO staff resigned. Turnover in university technology transfer offices is not uncommon, but such turnover is not optimal for responsive service or effective IP protection or marketing. Since then the staff complement has been rebuilt. A new Director was hired in April 2004. At the end of fiscal 2003/2004, dedicated staff consisted of the Director, 2 technology transfer managers, a technology transfer assistant and partial secretarial support. A third manager was hired subsequent to the University's fiscal 2003/2004 year-end. Accounting services are provided by Research Financial Services and information technology support is provided by Research Communications, both other departments within the Office of the Vice President of Research. Royalties paid to OMAF on non-germplasm IP for the university's fiscal 2003/2004 amounted to $140,875; versus costs charged of $46,040.

Other statistics:

Disclosures represent the beginning of the intellectual property commercialization pathway (though "marketing pull" to encourage disclosures is often a necessary precursor). Total disclosures for the office and OMAF-related disclosures are shown in the following table:

Disclosures						
Fiscal year	2003			2004		
	Germplasm	Other	Total	Germplasm	Other	Total
All disclosures	145	10	155	25	19	44
OMAF related	145	1	146	25	6	31

Germplasm disclosures for 2002/2003 (ended March 31, 2003) consisted of 14 canola, 38 soybean, 11 cherry, 43 plum and 39 maize varieties. In 2003/2004 (ended March 31, 2004) 17 barley, 1 oat and, 3 wheat and 4 soybean disclosures were made. It should be noted that it takes 2 years to virus index fruit tree cultivars and it may be 7 to 10 years before they are named and introduced to the marketplace. Fruit trees disclosures tend to be infrequent and also tend to be disclosed in groups. Moreover, fruit tree cultivars have limited revenue potential due to small market size. The reduction in maize and soybean releases can be attributed to delays arising from negotiations pertaining to background IP and/or use of proprietary genes.

Patent Activity and status for University fiscal 2003/2004 (ended April 30, 2004)

Applications	Initiated	Follow-on	Total
Total	5	8	13
OMAF related	1	4	5

Issued in year	Canada	US	Other	Total
Total	0	4	3	7
OMAF related	0	0	2	2

End of Year Patents Held	Canada	US	Other	Total
Total	9	33	46	87
OMAF related	3	10	31	44

Held Patents licensed	Canada	US	Other	Total
Total	9	19	36	63
OMAF related	3	6	26	35

It should be noted that the University has licensed a substantial portion of its issued patent portfolio. Comparative figures for other universities are difficult to obtain, but this percentage seems higher than the informally quoted range in percentages of 15% - 40% from many other universities. Six applications for plant breeder's rights were also filed during the germplasm fiscal year ended March 31, 2004.

New License Activity:

Germplasm: 24 exclusive and 8 non-exclusive licenses were signed during the OMAF fiscal year ended March 31, 2004. All of the exclusive licenses were to Canadian companies – 18 large and 6 small companies. Five of the exclusive licenses were signed with sponsors of research contracts (3 were large companies; 2 were small). The non-exclusive licenses were evenly divided – 4 to large Canadian companies, 4 to foreign companies (3 large, 1 small). None of the non-exclusive licensees sponsored research contracts to generate the licensed matter.

Non-germplasm: Six license agreements were signed during the year and one contingent license agreement was signed. Of the six licenses, 4 were exclusive, 2 were non-exclusive. Three of the exclusive licenses were for technologies for which CRESTech provided development funding. The University Collaboration Agreement dated January 1, 1998 with CRESTech required mandatory licensing to CRESTech and commercialization by CRESTech. Disclosures were directly to CRESTech, bypassing normal university procedures including the standard disclosure meeting and minutes that OMAF normally attends and signs. OMAF funded technology related to three of the exclusive license agreements (2 of which are licensed to CRESTech). The recent amalgamation of the 4 separate Ontario Centers of Excellence into OCE Inc. has made obtaining information as to status difficult.

4.2 Patent Portfolio

The germplasm portfolio represents more than 1700 disclosures as all previously disclosed cultivars can be used in future breeding programs. The OMAF related, non-germplasm portfolio at the end of the year was as follows:

Title	Tech Status
JEB diagnostic test for Belgian horses	Licensed – Non-Exclusive
Cow's milk fortified with nervonic acid by natural in vivo fortification	Marketing
Nervonic acid consumption	Marketing
Reduction of Sperm Sensitivity to chilling/freezing	Negotiation - 4 part
Cytopathic Type 2 Bovine Viral Diarrhea Virus (BVDV) Strain 53637	Licensed – Non-Exclusive (one-time fee)
Recombinant fowlpox virus (rFPV) and Recombinant baculovirous (rBV) expressing the HN gene of Newcastle disease virus	MTA with company who is still using materials, requires backgrd license
Injection-Port Chamber for the Single-Barrel Silanization of Multibarrel Ion-Selective Microelectrodes	Licensed - Exclusive to OCE
Hypobaric plant growth chambers for plant studies under reduced atmosphere and variable pressure	Licensed - Exclusive to OCE
Acidophilus/ Bifidus Milk Products	Licensee determined to be insolvent
Novel Inducible Genes from Alfalfa and Methods of Use There of	Negotiation
Production of Human Immunoglobulins in Chicken Eggs	Contingent license under negotiation
Transgenic animals expressing salivary phytase	Marketing by MaRS
Custom Feed Supplement to Maximize Omega-3 Fatty Acids in Cow's Milk	Licensed - Exclusive with right to sub-license
Garlic Processing Technique	Licensed - Exclusive
High Liquid Margarine with Low Saturated Fatty Acids and Zero Trans Fatty Acids	Marketing at yr end - subsequent abandonment recommendation
Embryogenesis and Plant Regeneration from Microspores	Option to large company
Method of identifying high immune response periparturient animals	Licensed - Exclusive
Pressure and ultrasound-guided cardiac catheter for transvenous electrical cardiodiversion of equine supra-ventricular cardiac arrhythmias	Term Sheet completed, working on formal Agreement

Title	Tech Status
Process to induce desiccation tolerance in somatic embryos	Licensed
Enhanced Root Production in Transgenic Perennial Plants	3 year option now expired
Porcine Adenovirus Based Vector, Vaccine	Option
Fowl Adenovirus (FAdV) based vaccine for Poultry; FAdV based expression vector for Gene Delivery	Evaluation by company- license being negotiated
Diagnosis for Porcine Malignant Hyperthermia	Licensed - Non-Exclusive to many companies
Inhibition of Phospholipase D activity by C6 Aldehydes and Alcohols	Licensed - Exclusive
Development of a Novel Antioxidant Formulation to Control Superficial Scald in Apples	Licensed - Exclusive
Porcine Embryo Production, Recovery, Maintenance and Transfer Systems for Use in Domestic and International Genetic Transport and the Elimination of Environmental Pathogens in Swine.	Licensed - Non-Exclusive
Micropropagation technologies for phytopharmaceutical: St. John's Wort	Option associated with company research contract
Vaccine for Prevention of Pasteurella haemolytica pneumonia in Cattle.	Licensed - Exclusive
Method for Identifying Pigs with Genetically Reduced Levels of Boar Taint Steroids	Option
Genetic Markers for Pigs with Low Skatole (P450IIE)	Option
Identification of Metabolites and Key Enzymes in Skatole Metabolism in Liver	Option
Genetic Marker for Boar Taint in Sulphur Transferase	Option

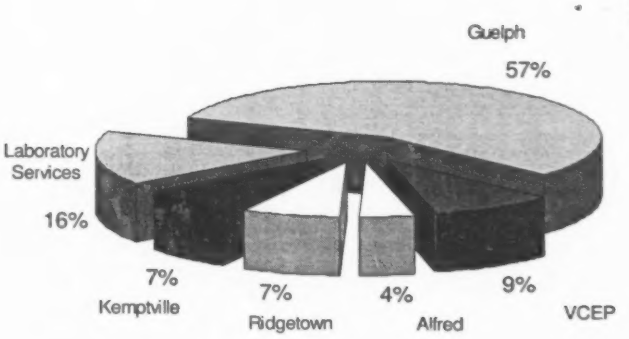
5. FINANCIAL SUMMARY

This presentation shows the net actual expenditures (i.e., total expenses less revenues) of OMAF transfer funds, by location for 2003/2004. The values presented reflect any carry-forwards of unspent funds from fiscal 2002/2003.

The actual transfer of funds under the OMAF University of Guelph agreement was $50.5 million in 2003/2004. The total net expenditure of $50.4 million reflects a $100,000 overall addition to carry-forward funds. Carry-forwards for individual units may have been used or increased depending on the expenditure levels and operations of those individual units (Refer to Table 5.1).

Fig. 1. Distribution of Transfer Payment 2003/2004

Location	2003/2004 Program Costs $ (millions)	%	2002 / 2003 Program Costs $ (millions)	%
Guelph [1]	**28.4**	**56%**	27.3	54%
VCEP [2]	**4.7**	**9%**	4.6	9%
Alfred	**2.2**	**4%**	2.1	4%
Ridgetown	**3.7**	**7%**	3.8	8%
Kemptville, New Liskeard	3.5	7%	3.5	7%
Laboratory Services	**7.9**	**16%**	9.2	18%
Total:	***50.4***	***100%***	*50.5*	*100%*



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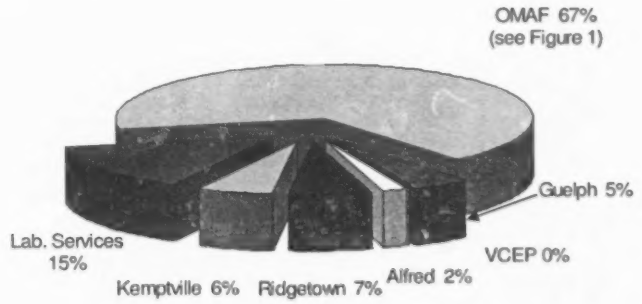
[1] Includes expenditures for research stations at Arkell, Elora, Ponsonby, Woodstock and Guelph Turfgrass Institute, former HRIO locations (Vineland, Simcoe, Bradford) and all Guelph campus research and diploma education activities. HRIO operations were included with Guelph operations beginning May 2002.
[2] Veterinary Clinical Education Program

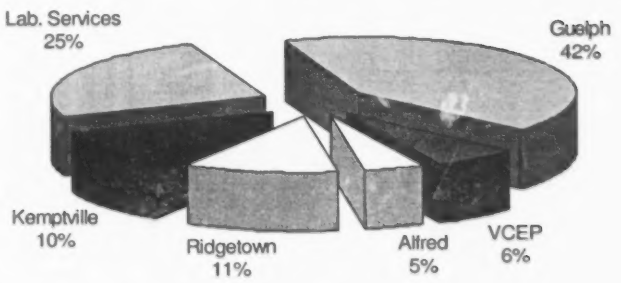
Fig. 2. OMAF Contract Financial Results – 2003/2004 Expenditures and Revenues

Location	Fiscal 2003 / 2004 Expenditures $ (millions)	%	Fiscal 2003 / 2004 Revenues $ (millions)	%	Fiscal 2002 / 2003 Expenditures $ (millions)	%	Fiscal 2002 / 2003 Revenues $ (millions)	%
OMAF Agreement			**50.4**	**67%**			50.9	69%
Guelph [1]	**31.9**	**42%**	**3.4**	**5%**	32.7	44%	4.0	5%
VCEP [2]	**4.7**	**6%**	**0.0**	**0%**	4.6	6%	0.0	0%
Alfred	**3.5**	**5%**	**1.3**	**2%**	3.4	5%	1.3	2%
Ridgetown	**8.6**	**11%**	**4.9**	**7%**	8.3	11%	4.3	6%
Kemptville	**7.8**	**10%**	**4.2**	**6%**	7.5	10%	4.2	6%
Lab. Services	**18.8**	**25%**	**11.0**	**15%**	17.2	23%	9.0	12%
Total:	***75.3***	***100%***	***75.3***	***100%***	*73.7*	*100%*	*73.7*	*100%*

OMAF Contract: 2003/2004 REVENUES



OMAF Contract: 2003/2004 EXPENDITURES



[1] Includes expenditures for research stations, former HRIO locations (Vineland, Simcoe, Bradford) and all Guelph campus research and diploma education activities. HRIO operations were included with Guelph operations beginning May 2002

[2] Veterinary Clinical Education Program

Table 5.1: OMAF Program Summary – 2003/2004 Expenditures and Revenues vs Budget by Location (in thousand's of dollars)

Program Area	Alfred			Kemptville			Ridgetown			Lab Services Div.			Guelph			TOTAL		
	Budget	Actual	Balance	*Budget*	Actual	Balance	*Budget*	Actual	Balance	*Budget*	Actual	Balance	*Budget*	Actual	Balance	*Budget*	**Actual**	Balance
Research																		
Total Expenses	110	143	(33)	2,093	2,116	(23)	2,681	2,431	250	-	15	(15)	22,288	23,456	(1,168)	27,172	28,161	(989)
Revenues	15	25	10	260	406	146	370	273	(97)	-	18	18	1,244	1,866	622	1,889	2,588	699
Net Expenses	*95*	*118*	*(23)*	*1,833*	*1,710*	*123*	*2,311*	*2,158*	*153*	*-*	*(3)*	*3*	*21,044*	*21,590*	*(546)*	*25,283*	*25,573*	*(290)*
Education [2]																		
Total Expenses	1,713	1,818	(105)	4,584	4,393	191	5,462	5,299	163	-	-	-	954	968	(14)	12,713	12,478	235
Revenues	1,015	1,046	31	3,721	3,765	44	3,947	4,586	639	-	-	-	935	854	(81)	9,618	10,251	633
Net Expenses	*698*	*772*	*(74)*	*863*	*628*	*235*	*1,515*	*713*	*802*	*-*	*-*	*-*	*19*	*114*	*(95)*	*3,095*	*2,227*	*868*
Veterinary Clinical Education Program (VCEP)																		
Total Expenses	-	-	-	-	-	-	-	-	-	-	-	-	4,697	4,693	4	4,697	4,693	4
Revenues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net Expenses	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*-*	*4,697*	*4,693*	*4*	*4,697*	*4,693*	*4*
Laboratory Services				[1]	[1]	[1]												
Total Expenses	-	-	-	81	83	(2)	-	-	-	11,143	12,260	(1,117)	24	5	19	11,248	12,348	(1,100)
Revenues	-	-	-	-	-	-	-	-	-	7,650	9,839	2,189	-	-	-	7,650	9,839	2,189
Net Expenses	*-*	*-*	*-*	*81*	*83*	*(2)*	*-*	*-*	*-*	*3,493*	*2,421*	*1,072*	*24*	*5*	*19*	*3,598*	*2,509*	*1,089*
Institutional Infrastructure and Support																		
Total Expenses	1,467	1,530	(63)	1,363	1,180	183	1,029	904	125	7,959	6,566	1,393	5,139	7,445	(2,306)	16,957	17,625	(668)
Revenues	271	258	(13)	44	78	34	53	58	5	1,135	1,109	(26)	1,050	723	(327)	2,553	2,226	(327)
Net Expenses	*1,196*	*1,272*	*(76)*	*1,319*	*1,102*	*217*	*976*	*846*	*130*	*6,824*	*5,457*	*1,367*	*4,089*	*6,722*	*(2,633)*	*14,404*	*15,399*	*(995)*
Total - All Programs																		
Total Expenses	3,290	3,491	(201)	8,121	7,772	349	9,172	8,634	538	19,102	18,841	261	33,102	36,567	(3,465)	72,787	75,305	(2,518)
Revenues	1,301	1,329	28	4,025	4,249	224	4,370	4,917	547	8,785	10,966	2,181	3,229	3,443	214	21,710	24,904	3,194
Net Expenses	*1,989*	*2,162*	*(173)*	*4,096*	*3,523*	*573*	*4,802*	*3,717*	*1,085*	*10,317*	*7,875*	*2,442*	*29,873*	*33,124*	*(3,251)*	*51,077*	*50,401*	*676*

[1] Expenses in the Kemptville 'Laboratory Services' cost categories pertain to the operation of the SPUD unit at NLARS.
[2] Includes: Diploma Education & Continuing Education/Business Development & Training.

Table 5.2: 2003/2004 OMAF Contract Allocated by Program and Location (in thousand's of dollars)
Note: Values shown include infrastructure and support for the respective program areas.

	Alfred [1]	Kemptville	Ridgetown	Lab. Services	Guelph	Total
Research	245	2,644	2,720	15	29,618	**35,242**
Education						
- Diploma Ed.	1,954	1,766	2,623	-	1,191	**7,534**
- Continuing Ed.	1,013	1,500	2,132	-	-	**4,645**
- Ancillary Service	278	1,862	1,159	-	-	**3,299**
Education Sub-total	3,245	5,128	5,914	-	1,191	**15,478**
VCEP					5,757	**5,757**
Lab. Services				18,827		**18,827**
Total	**3,490**	**7,772**	**8,634**	**18,842**	**36,566**	**75,304**

[1] Infrastructure costs at Alfred include the cost of utilities and maintenance ($135k in 02/03; $141k in 03/04)

6. MEDIA COVERAGE

Between May 2003 and April 2004, the combined efforts of students in Owen Roberts's agricultural communication classes and in Students Promoting Awareness of Research Knowledge (SPARK), both based at the University of Guelph, have produced the following list of published articles and stories on a variety of OMAF-sponsored projects. These articles have appeared in a number of different periodicals and publications, and cover the spectrum of the university's many different research institutions and sites, including the Axelrod Institute of Ichthyology, Laboratory Services Division, the regional colleges – Kemptville College, Ridgetown College and CollΠge d'Alfred – and the research stations in Vineland and Arkell, as well as the six colleges on U of G's main campus. The main vehicles for publication are the Ontario farm media, the Guelph *Mercury* through the weekly column *SPARKPlugs* and the University's *Research* magazine. In addition, selected articles are also distributed over the Canadian Press Wire Service, which allows for extensive exposure of OMAF's research projects. Through the agreement with OMAF's Town & Country Ontario television now sees the students contribute InfoBreaks to that program, as well. These and other articles can be accessed from the U of G Research News website at www.uoguelph.ca/research/news/index.shtml and general information on the University's research communications can be found at www.uoguelph.ca/research/communications/index.shtml.

* * *

***Research* Magazine – Summer 2003**

"Enriched for health: New project creates isoflavone-rich soy variety," *Research* magazine – Summer 2003 (Istvan Rajcan – Department of Plant Agriculture)

"Repairing the irreparable: This research could help treat spinal injuries," *Research* magazine – Summer 2003 (Dean Betts – Department of Biomedical Sciences and Brigitte Brisson – Department of Clinical Studies)

"Improved fertility for happier horses," *Research* magazine – Summer 2003 (Jim Petrik – Department of Biomedical Sciences)

"Beefing up immunity: New facility focuses on how to help animals stay strong against disease," *Research* magazine – Summer 2003 (Jeff Caswell – Department of Pathobiology)

"These chickens will recoup: Genes behind poultry disease may help animals, humans," *Research* magazine – Summer 2003 (Shayan Sharif – Department of Pathobiology)

"Warming up to aquaculture: New facilities mean warm-water fish are coming to Canada," *Research* magazine – Summer 2003 (Glen Van Der Kraak – Department of Zoology)

"Easy-breathing pigs: Disease resistance in tracheal cells helps clear the airways," *Research* magazine – Summer 2003 (Julang Li - Department of Animal and Poultry Science)

"Eating up new vaccines: Edible vaccine technology takes a bite out of shipping fever," *Research* magazine – Summer 2003 (Patricia Shewen and Douglas Hodgins – Department of Pathobiology)

"Solving conflicts in the country," *Research* magazine – Summer 2003 (Wayne Caldwell – School of Environmental Design and Rural Planning)

"Towards taint-free pork products," *Research* magazine – Summer 2003 (Jim Squires and Ian Duncan – Department of Animal and Poultry Science)

"Research that regenerates: From food to drug production, plant scientists are harnessing flower power," *Research* magazine – Summer 2003 (Manish Raizada – Department of Plant Agriculture)

"What goes up, must have food: Unearthing the possibilities for growing plants on Mars," *Research* magazine – Summer 2003 (Mike Dixon – Department of Environmental Biology)

"Target: Dutch elm and dollar spot disease: Researchers find similarities oceans apart," *Research* magazine – Summer 2003 (Greg Boland – Department of Environmental Biology)

"Slow and Steady. New growing methods could mean better fruit and a healthier environment," *Research* magazine – Summer 2003 (John Cline – Department of Plant Agriculture)

"Project SOY: It's bean amazing," *Research* magazine – Summer 2003 (Project SOY)

Guelph Mercury

"Plant researchers harness regenerative flower power," *Guelph Mercury* Saturday, June 21, 2003 (Manish Raizada – Department of Plant Agriculture)

"Warming up to aquaculture with the right stuff," *Guelph Mercury* Saturday, July 5, 2003 (Glen Van Der Kraak – Department of Zoology)

"Counting the capacity for economic change," *Guelph Mercury* Tuesday, July 15, 2003 (David Douglas – School of Environmental Design and Rural Development)

"Next on the transgenic list: production," *Guelph Mercury* August 5, 2003 (Serguei Golovan – Department of Animal and Poultry Science)

"Researcher looks at recipes for weed-free farm fields," *Guelph Mercury* November, 28, 2003 (François Tardif – Department of Plant Agriculture)

"Better barley breeding yields results," *Guelph Mercury* January 8, 2004 (Duane Falk – Department of Plant Agriculture)

"Sprouting safer seeds shines spotlight on health benefits," *Guelph Mercury* March 5, 2004 (Keith Warriner – Department of Food Science)

"Wastewater woes targeted at source," *Guelph Mercury* April 23, 2004 (Chris Kinsley – Collège d'Alfred)

***Pigs Pork and Progress* – Spring 2004**

"Food safety from farm to fork," *Pigs Pork and Progress* — Spring 2004 (Robert Friendship – Department of Population Medicine)

"Healthy one day, sick the next: Researchers probe bacterial infection path to control swine disease," *Pigs Pork and Progress* — Spring 2004 (Janet MacInnes – Department of Pathobiology)

"That scent? Antibiotic substitutes: Plant extracts could be promising alternatives to conventional treatments," *Pigs Pork and Progress* — Spring 2004 (Joshua Gong – Agriculture and Agri-Food Canada)

"Good bugs versus bad bugs: Potential alternative treatments are emerging for promoting gut health," *Pigs Pork and Progress* — Spring 2004 (Robert Friendship – Department of Population Medicine)

"Liquid feed helps deliver probiotics," *Pigs Pork and Progress* — Spring 2004 (Robert Friendship – Department of Population Medicine and Kees de Lange – Department of Animal and Poultry Science)

"Understanding *E. coli* resistance: Research will improve treatment and prevention strategies," *Pigs Pork and Progress* — Spring 2004 (Patrick Boerlin – Department of Pathobiology)

"PRRS vaccine may affect sperm health: Don't use it for breeding boars, say researchers," *Pigs Pork and Progress* — Spring 2004 (Cate Dewey – Department of Population Medicine)

"Frozen semen: it's a delicate matter: Researchers look to new protective solutions when freezing boar semen," *Pigs Pork and Progress* — Spring 2004 (Mary Buhr – Department of Animal and Poultry Science)

"A step towards reducing lost pregnancies," *Pigs Pork and Progress* — Spring 2004 (Anne Croy – Department of Biomedical Sciences)

"Cattle pathogen may affect pigs, too," *Pigs Pork and Progress* — Spring 2004 (Heidi Engelhardt – Department of Animal and Poultry Science)

"Small efforts make a big difference to newborn piglets: Heat, oxygen – and bovine colostrum – get them off to a great start," *Pigs Pork and Progress* — Spring 2004 (Roger Hacker – Department of Animal and Poultry Science)

"Adjusting the internal clock: Researchers use lighting intervals to stimulate resting in piglets," *Pigs Pork and Progress* — Spring 2004 (Suzanne Millman – Department of Population Medicine)

"A mighty wind: Drafty barns aren't to blame for all piglet vices," *Pigs Pork and Progress* — Spring 2004 (Tina Widowski – Department of Animal and Poultry Science)

"Happy together: Production may be improved by understanding recognition," *Pigs Pork and Progress* — Spring 2004 (Ian Duncan – Department of Animal and Poultry Science)

"Small piglets need extra attention: Maximum care makes problems more rare," *Pigs Pork and Progress* — Spring 2004 (Cate Dewey – Department of Population Medicine)

"Searching for the elusive fat gene: Researchers uncover clues for understanding fat deposition," *Pigs Pork and Progress* — Spring 2004 (Xianghai Ye, Andy Robinson and Ann Gibbing – Department of Animal and Poultry Science)

"It's very unCOOL: Country-of-origin labelling will add costs and cut margins, say researchers," *Pigs Pork and Progress* — Spring 2004 (John Cranfield, Randy Duffy - Department of Agricultural Economics and Business, and Ken McEwan – Ridgetown College)

"Fibre-rich feed needs extra punch: Threonine supplements are vital if you're feeding high fibre," *Pigs Pork and Progress* — Spring 2004 (Kees de Lange, Department of Animal and Poultry Science)

"Don't forget the water factor: Humans produce 40 times more waste than pigs," *Pigs Pork and Progress* — Spring 2004 (Ron Fleming – Ridgetown College)

"Time to fine-tune phosphorus: Conventional measurements significantly underestimate digestibility," *Pigs Pork and Progress* — Spring 2004 (Ming Fan – Department of Animal and Poultry Science)

"One step closer to odourless manure: An electrifying approach could give farmers a breath of fresh air," *Pigs Pork and Progress* — Spring 2004 (Nigel Bunce – Department of Chemistry and Biochemistry)

"Abating climate change," *Pigs Pork and Progress* — Spring 2004 (Ron Fleming - Ridgetown College and Claudia Wagner-Riddle – Department of Land Resource Science)

"Adding science to on-farm cremation: Farmers' interest in disposal alternatives leads to field trials for commercial units," *Pigs Pork and Progress* — Spring 2004 (Bill Van Heyst – School of Engineering)

Ontario Milk Producer

"A better way: Improved system developed to rank and select sires for longevity," *Ontario Milk Producer* – May 2003 (Larry Schaeffer – Department of Animal and Poultry Science)

"Beat bovine bellyaches: Cows cure their acidic rumens with sodium bicarbonate," *Ontario Milk Producer* – August 2003 (Brian McBride – Department of Animal and Poultry Science)

"Mastitis mystery: Genetic link sought in bid to breed animals resistant to inflammation," *Ontario Milk Producer* – September 2003 (Niel Karrow – Department of Animal and Poultry Science)

"Less environmental mess: Cutting back on excessive phosphorus in feed doesn't hurt cows," *Ontario Milk Producer* – October 2003 (Brian McBride – Department of Animal and Poultry Science)

"A new approach: genetic selection for mastitis resistance based on origin of pathogen," *Ontario Milk Producer* – November 2003 (Larry Schaeffer – Department of Animal and Poultry Science)

"Johne's control: New method would diagnose disease in cattle earlier than now possible," *Ontario Milk Producer* – January 2004 (Lucy Mutharia – Department of Microbiology)

Research Facts

"Decreasing reliance on antibiotics," *Research Facts* – 2004

"Sustainable, innovative rural communities," *Research Facts* – 2004

***Focus On Soybeans* – April 2004**

"Student innovation yields big results with Project SOY," *Focus on Soybeans* – April 2004 (Project SOY)

CIFIR Portal

"New tool fights animal disease outbreaks," *Portal* – Fall 2003 (Deb Stacey – Computing and Information Science/SHARCNET)

Pork News (Ontario Pork Newsletter)

"Solving conflicts in the country," *Pork News* – June 2003 (Wayne Caldwell – School of Environmental Design and Rural Planning)

"New farrowing induction methods designed to beat the clock," *Pork News* – October 2003 (Glen Cassar and Robert Friendship, Department of Population Medicine)

"Gear-up for liquid feeding," *Pork News* – November 2003 (Kees de Lange, Department of Animal and Poultry Science)

"Checking nutrient flow: Researchers track manure nutrient path through fields," *Pork News* – December 2003 (John Lauzon of the Department of Land Resource Science)

"Good bugs, better guts - Antibiotics alternative could promote swine intestinal health," *Pork News* – February 2004 (Robert Friendship - Department of Population Medicine and Kees de Lange - Department of Animal and Poultry Science)

"Rounding up the resisters: Guelph researcher surveys Ontario swine farms for antimicrobial resistance," *Pork News* – March 2004 (Nicol Janecko, Department of Population Medicine)

Greenhouse Canada

"Researchers find better ways to fight infection in hydroponically grown plants," *Greenhouse Canada* – 2003 (John Sutton – Department of Environmental Biology)

Better Farming

"Across the agri-food spectrum innovation is the name of the game," *Better Farming* – Aug/Sept 2003 (by Owen Roberts)

Ontario Beef

"More good fats: it's an inside job," *Ontario Beef* – May 2003 (Ira Mandell – Department of Animal and Poultry Science)

"Beefing up immunity: New facility focuses on how to help animals stay strong against disease," *Ontario Beef* – May 2003 (Jeff Caswell - Department of Pathobiology)

"An immune boost for cattle health: Researchers add an extra dose of immunity to vaccines," *Ontario Beef* – December 2003 (Patricia Shewen and Doug Hodgins – Department of Pathobiology)

"Nitrogen Losses need to be quantified," *Ontario Cattlemen's Association* - *http://cattle.guelph.on.ca/research/stories* (John Lauzon - Department of Land Resource Science)

"Going with the flow: How do nutrients and bacteria move through soil?" *Ontario Cattlemen's Association* - http://cattle.guelph.on.ca/research/stories (John Lauzon, Gary Parkin, Michael Goss, Bill Deen and Steve Crittenden – Departments of Land Resource Science and Plant Agriculture)

Ontario Dairy Farmer

"Improved protection from mastitis vaccines: A new study reports improved performance with modified immunization schedule for coliform mastitis," *Ontario Dairy Farmer* – March 2004 (Christina Petersson – Department of Population Medicine)

Ontario Poultry Farmer

"Making a clean breast of it: University of Guelph researcher is betting on bedding as turkey disease cause," *Ontario Poultry Farmer* – Fall 2003 (Bruce Hunter – Department of Pathobiology)

"These chickens will recoup: Genes behind poultry disease may help animals and humans," *Ontario Poultry Farmer* – Summer 2003 (Shayan Sharif – Department of Pathobiology)

Soybean Report (Ontario Soybean Growers)

"OSG will continue to push for MRI or replacement," *Soybean Report* – January 2004 (Agricultural Policy Framework)

"Ontario plant pathologist receives inaugural award," *Soybean Report* – February 2004 (Albert Tenuta)

"Keeping an eye on soybean rust," *Soybean Report* – March 2004 (Albert Tenuta)

A Sampling of Success Stories

"Fat: It's so unpredictable," *A Sampling of Success Stories of Federal and Provincial Investment in University Research* (Alejandro Marangoni – Department of Food Science)

"A glass of wine, an ounce of prevention," *A Sampling of Success Stories of Federal and Provincial Investment in University Research* (Gopi Paliyath – Department of Plant Agriculture and Kelly Meckling – Department of Human Biology and Nutritional Sciences)

Pigpens

"Soil tests get a second look for accuracy," *Pigpens* – Spring 2003 (Michael Goss – Department of Land Resource Science)

@Guelph

"Reinforcing Ontario's Rural Foundation: Education, involvement key to managing change in rural communities, say new studies," *@Guelph* – April 21, 2004 (David Douglas - School of Environmental Design and Rural Development and John Smithers - Geography)

APRIL 2004
7. UNIVERSITY OF GUELPH/ OMAF EQUIPMENT INVENTORY & LIBRARY RESOURCES

Summary of U of G / OMAF Equipment Inventories

as of June 2004 (see Note 1)

Location Name	Opening Balance (May 1, 2003)	Acquisitions (during 03/04)	Dispositions (during 03/04)	Ending Balance
Summary (totals of detailed data, below)				
All OMAF Program locations	**48,900,990**	**2,226,268**	**59,376**	**51,067,882**
N.B.: see explanatory notes at bottom				
Individual Location Details				
Alfred College *	1,889,939	54,971	-	1,944,910
Alma Aquaculture	767,209	207,034	-	974,243
Arkell Bull & Ram	30,000	10,000	-	40,000
Arkell Equine	5,000	3,000	-	8,000
Arkell Feedmill	812,000	-	-	812,000
Arkell Poultry	647,600	8,700	-	656,300
Arkell Swine	511,000	-	-	511,000
Elora Beef	863,840	52,200	-	916,040
Elora Dairy	661,600	18,600	-	680,200
Elora Plant Ag.	2,781,775	22,000	-	2,803,775
Emo	60,500	20,000	-	80,500
Guelph Research Station Operations	2,859,600	74,847	36,176	2,898,271
Guelph Turfgrass	27,000	550	-	27,550
Isolation Unit	11,000	-	-	11,000
Kemptville College *	1,431,689	77,030	-	1,508,719
Bradford Muck Stn	235,339	17,350	-	252,689
NLARS	1,049,400	9,500	1,500	1,057,400
Ponsonby Dairy	358,500	-	-	358,500
PGAF	270,784	18,500	-	289,284
Ponsonby Sheep	166,170	7,500	100	173,570
Ridgetown College *	4,388,893	235,983	-	4,624,877
Simcoe	650,700	61,300	-	712,000
Thunder Bay	98,500	-	20,000	78,500
Woodstock	548,400	30,000	1,600	576,800
Vineland	3,003,200	3,483	-	3,006,683
Lab Services	24,771,351	1,293,720	-	26,065,071

* Inventory values do not include library resources.

N.B.: See Note 1 re Equipment Asset values on the next page.

Library Resources	
Location	Replacement Value $ ('000)
Alfred	752
Kemptville	1,143
Ridgetown	1,227

Note 1: Equipment Inventory Values:
Under the terms of the OMAF/UofG Agreement, the University is required to submit reports on asset inventories by Junes 30th, annually.

Several improvements were implemented in the inventory reporting procedures prior to compilation and update of the June 2004 Inventory Report prepared for OMAF. The primary objectives of these charges were: 1) to improve the consistency and uniformity of reporting equipment values (in the past, some locations reported 'book' or 'purchase value', some reported 'replacement value', some reported both), 2) streamline the inventory reporting process (by eliminating reporting of redundant/unused data, and 3) to present the inventory information to OMAF in the form of a 'continuity schedule' (i.e., opening balance, acquisitions, dispositions and closing balance).
As a result of these changes, some of the inventory values reported in last year's Annual report are higher than the Opening Balance reported here. This is largely due to the method used in the past of estimating replacement value where only the book value was provided by the location in order to report all equipment on an 'estimated replacement value basis'. Under the new valuation process, all equipment is reported on a 'purchase price' basis, hence the lower valuations under the new system. The purchase price of some older equipment (> 10 years old) had to be estimated.

APRIL 2004
8. INVENTORY AND RENTS OF DWELLING HOUSES STATUS

Kemptville College	**# Units**		
Kemptville	1		
New Liskeard	3		
Total	4		
Revenue		12,382	
Expenses		3,674	
Account balance: Opening			**42,765**
Closing			**51,473**

Ridgetown College			
Ridgetown	2		
Cedar Springs	1		
Total	3		
Revenue		23,353	
Expenses		12,006	
Account balance: Opening			**41,700**
Closing			**53,047**

Guelph Stations			
Ariss	3		
Cambridge	0		
Alma	1		
Hall House	1		
Ponsonby	1		
Arkell	3		
Simcoe	1		
Vineland	2		
Total	12		
Revenue		66,000	
Expenses		66,111	
Account balance: Opening			**5,796 ***
Closing			**5,685**

* An adjustment was made to the 2003/2004 closing balance in last year's Annual Report.

APRIL 30, 2004
9. LIVESTOCK INVENTORIES

	OPENING MAY 1, 2003	SOLD	DIED [1]	TRANSFERRED		BORN OR ACQUIRED	CLOSING APRIL 30, 2004
				IN	OUT		
ALFRED							
DAIRY	58	22	3	0	4	39	68
KEMPTVILLE							
DAIRY	98	99	6	0	0	122	115
NEW LISKEARD							
BEEF	282	162	5	0	0	228	343
RIDGETOWN							
DAIRY	70	42	3	0	0	39	64
BEEF	36	10	2	0	0	12	36
SWINE	469	1,117	68	44	12	1,083	399
GUELPH							
ARKELL EQUINE	68	15	12	187	184	17	61
ARKELL POULTRY	4,643	1,914	1,495	59	8,618	13,627	6,302
ARKELL SWINE	1,730	3,484	2,541	0	661	6,951	1,995
ALMA AQUA	112,300	70,741	48,869	6,493	9,700	122,817	112,300
SWINE	0	6	0	16	0	0	44
SHEEP	0	0	0	44	0	0	44
ELORA DAIRY	296	91	32	18	41	151	301
ELORA BEEF	461	276	11	54	84	267	411
PONSONBY DAIRY	103	35	8	9	27	56	98
PONSONBY (GAF) [2]	100	240	0	253	46	1	68
PONSONBY SHEEP	369	238	76	2	127	550	480
CLINICAL STUDIES							
DAIRY	68	7	0	75	19	1	118

[1] These figures include animals that are born dead and those which are euthanized for humane, disease and research reasons.

[2] General Animal Facility

10. ACRONYMS

AAFC	Agriculture and Agri-Food Canada
AHL	Animal Health Laboratory
ATP	Advanced Technology Programs
ARD	Agriculture and Rural Division
ARIO	Agricultural Research Institute of Ontario
AUCC	Association of Universities and Colleges of Canada
AVMA	American Veterinary Medical Association
BDC	Business Development Centre
BDT	Business Development and Training
BMP	Best Management Practice
BSE	Bovine Spongiform Encephalopathy
CCAC	Canadian Council of Animal Care
CE	Continuing Education
CEU	Continuing Education Unit
CFI	Canadian Foundation for Innovation
CFIA	Canadian Food Inspection Agency
CHA	Canadian Healthcare Association
CVMA	Canadian Veterinary Medical Association
CVO	College of Veterinarians of Ontario
DVM	Doctor of Veterinary Medicine
DVSc	Doctor of Veterinary Science
EDRC	Elora Dairy Research Centre
EHS	Environmental Health & Safety
ERP	Emergency Response Plan
FID	Food Industry Division
FTE	Full Time Equivalent
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GLP	Good Laboratory Practices
HACCP	Hazard Analysis and Critical Control Point
HPLC	High Pressure Liquid Chromatograpgy
HRIO	Horticultural Research Institute of Ontario
IP	Intellectual Property
IPM	Integrated Pest Management
IR	Immune Response
LOI	Letter of Intent
LS	Laboratory Services Division
MOE	Ministry of the Environment
MTCU	Ministry Training, Colleges and Universities
NCE	Network of Centres of Excellence
NLARS	New Liskeard Agricultural Research Station
OABA	Ontario Agri Business Association
OAC	Ontario Agricultural College
OAVT	Ontario Association of Veterinary Technicians
OCPA	Ontario Corn Producers' Association
OIT	Ontario Innovation Trust
OMAF	Ontario Ministry of Agriculture and Food
OPEP	Ontario Pesticide Education Program
OVC	Ontario Veterinary College
PCR	Polymerase Chain Reaction
PMA	Performance Measures Agreement

RME	Resource Management and Environment
RPD	Research Program Director
SPARK	Students Promoting Awareness of Research Knowledge
SRC	Sustainable Rural Communities
SSHRCC	Social Sciences and Humanities Research Council of Canada
TORC	The Ontario Rural Council
U of G	University of Guelph
VCEP	Veterinary Clinical Education Program
VTH	Veterinary Teaching Hospital
WHMIS	Workplace Hazardous Materials Information System